From: Whittaker, Laura [laura.whittaker@aptim.com]
Sent: Friday, September 7, 2018 5:20 AM
To: Liscio, Matthew P CIV SEA 04, NAVSEA DET RASO [matthew.liscio@navy.mil]
CC: Howard, Leslie A CIV NAVFAC SW [leslie.howard@navy.mil]; Fowler, Janet CIV NAVSEA, SEA 04N [janet.fowler1@navy.mil]; Johnson, Nels [Nels.Johnson@aptim.com]; Schul, Raymond [raymond.schul@aptim.com]; Guillory, Jeffrey [jeffrey.guillory@aptim.com]; Amy Mangel [amy.mangel@aptim.com]; Hanelt, Norm [Norm.Hanelt@aptim.com]; Killpack, Randall [randall.killpack@aptim.com]; Chi, Minhsec [minhsec.chi@aptim.com]; Orman, Sean [sean.orman@aptim.com]; Rogers, Bryon [bryon.rogers@aptim.com]
Subject: [Non-DoD Source] Data package ready for review - HPNS PE-2, RSY C8 (Use 11)
Attachments: HPNS APTIM RSY C8 (Use 11) Soil Non-LLRW Concurrence Request 09072018 (reduced).pdf

Mr. Liscio,

APTIM request RASO concurrence to designate this soil as Non-LLRW soil.

If there are any questions or if additional data is required, please contact me.

Thank you.

LAURA WHITTAKER
Radiological Technician 4 (RCT IV)

APTIM | Radiation Safety

M 423 544 9145
E laura.whittaker@aptim.com

APTIM

2410 Cherahala Blvd
Knoxville, TN 37932

APTIM.com

Hunters Point Naval Shipyard, Parcel E-2
RSY Data Report

Contract No. EMAC III CTO-0013		
RSY Pad: C8	RSY Pad Use Number: USE 11	First Submittal ☑ Second Submittal ☐
Data attached and submitted by: Laura Whittaker		Data Report Submittal Date: 09/08/2018

Soil Sample Data					
Sample Identification	Survey Location	Type of Sample	^{226}Ra Final Analytical Results (pCi/g)	^{137}Cs Final Analytical Results (pCi/g)	Total Sr Final Analytical Results (pCi/g)
Upper limit of site reference background			1.633	0.113	0.331
PE2-RSYC8-U11-S001	1	Systematic	0.826	-0.00437	0.0393
PE2-RSYC8-U11-S002	2	Systematic	0.634	-0.0475	N/A
PE2-RSYC8-U11-S003	3	Systematic	0.460	0.0364	N/A
PE2-RSYC8-U11-S004	4	Systematic	0.226	0.007	N/A
PE2-RSYC8-U11-S005	5	Systematic	0.483	0.00883	N/A
PE2-RSYC8-U11-S006	6	Systematic	0.486	0.0289	N/A
PE2-RSYC8-U11-S007	7	Systematic	0.370	0.0278	N/A
PE2-RSYC8-U11-S008	8	Systematic	1.22	0.0492	N/A
PE2-RSYC8-U11-S009	9	Systematic	0.560	0.0382	N/A
PE2-RSYC8-U11-S010	10	Systematic	0.621	0.000	N/A
PE2-RSYC8-U11-S011	11	Systematic	0.490	0.00345	0.0706
PE2-RSYC8-U11-S012	12	Systematic	0.598	0.0186	N/A
PE2-RSYC8-U11-S013	13	Systematic	0.388	-0.0362	N/A
PE2-RSYC8-U11-S014	14	Systematic	0.190	0.0132	N/A
PE2-RSYC8-U11-S015	15	Systematic	0.756	0.0125	N/A
PE2-RSYC8-U11-S016	16	Systematic	0.588	-0.0110	N/A
PE2-RSYC8-U11-S017	17	Systematic	0.363	0.0249	N/A
PE2-RSYC8-U11-S018	18	Systematic	0.439	0.0283	N/A
LLRO Bounding Sample Data after removal of (LLRO #070318-1)					
PE2-RSYC8-U11-LLRO-S001	1	LLRO Bounding	0.330	-0.0239	N/A
PE2-RSYC8-U11-LLRO-S002	2	LLRO Bounding	0.623	0.0310	N/A
PE2-RSYC8-U11-LLRO-S003	3	LLRO Bounding	0.549	-0.0523	N/A
PE2-RSYC8-U11-LLRO-S004	4	LLRO Bounding	0.476	0.0304	N/A

^{226}Ra Radium-226
^{137}Cs Cesium-137
Sr Strontium
pCi/g Picocuries per gram
Sample results shown for ^{226}Ra and ^{137}Cs are from the final re-analysis

Instrument and Survey Data										
Activity	Survey #	Date	Meter	Calibration Due Date	Serial #	Reference Area Static Bkgd	Reference Area Static 3σ IL	Reference Area Scan Bkgd	Reference Area Scan 3σ IL	Range
RSI Gamma Walkover Survey	HPRS-06282018-PE2-ROV2-2675	06/28/2018	RS-701/ RSX-1	N/A	Console: 7236 Detectors: 5447,5448	N/A	N/A	3,400 CPS	4,872 CPS	2,189-**6,107**$^{+}$CPS
RSI Follow-up Static Survey	HPRS-07022018-PE2-JSS2-2690	07/02/2018	RS-701/ RSX-1	N/A	Console: 7236 Detectors: 5447,5448	3,612 CPS	4,255 CPS	N/A	N/A	2,587-**6,239**$^{+}$CPS
Systematic Sample Survey	HPRS-06292018-PE2-JSS-2688	06/29/2018	2221	07/12/2018	271439	15,783 CPM	18,714 CPM	N/A	N/A	11,643-14,002 CPM
Systematic Sample Survey	HPRS-07252018-PE2-JSS-2833	07/25/2018	2221	06/29/2019	117634	15,069 CPM	17,241 CPM	N/A	N/A	12,007-15,207 CPM
LLRO Bounding Sample Survey	HPRS-07032018-PE2-JSS-2721	07/03/2018	2221	07/12/2018	271439	15,783 CPM	18,714 CPM	N/A	N/A	11,527-12,401 CPM

\+ Gamma readings exceeding the Reference Area 3σ IL—see Note(s) in the Summary table (page 2) for more details.
3σ IL Investigation Level (established at 3σ above the mean of the Reference Area dataset)
CPS Counts per second
CPM Counts per minute

Summary

1) RSI gamma walkover survey and data review—upon review of initial scan data, follow-up static investigations were deemed necessary, and investigation locations were identified as per the RSI Data Evaluation Process (pages 3-4). Gamma scan coverage is shown on the Systematic Sample Survey map (page 8). Contour maps of scan data are shown on RSI Data Plots (page 5). Data review results are summarized on RSI Review Summary (page 6).

2) RSI Follow-up static survey—22 locations identified during the data review process were investigated. Follow-up location #22 exceeded the Reference Area static IL for regions of interest (ROIs) 6, 7, 8, and 10 (VD1). Follow-up locations are shown on the RSI Follow-up Static Survey map (page 7).

Note: During the follow-up investigation, a Low Level Radiological Object (LLRO) was identified at location #22 and removed (LLRO #070318-1). Once removed, a 2'x2' area was demarcated in the soil surrounding the LLRO location, and all soil within the over-excavation area was removed and controlled as LLRW. Bounding samples were then collected from the corners and final depth of 9" of the over-excavation area to confirm the removal of the elevated material. Follow-up static measurement taken at location #22 shows activity pre-remediation

3) Eighteen systematic soil samples (001-018) were obtained and submitted for gamma spectroscopy analysis. Sample locations for systematic samples are shown on the Systematic Sample Survey map (page 8). TestAmerica sample results are attached (pages 35-55 and 56-74).

Ten percent of the systematic soil samples (two samples in total, PE2-RSYC8-U11-S001 & PE2-RSYC8-U11-S011) were also analyzed for total strontium. Total Strontium results are also included in the TestAmerica sample results report (pages 35-55 and 56-74).

Note: Cesium-137 results included in the TestAmerica sample results report (pages 35-55) exceeded the project action limits for sample PE2-RSYC8-U11-S002 and PE2-RSYC8-U11-S010 . A re-analysis was performed and the sample results are within the project action limits (pages 75-86). and shown in the soil sample data table.

4) LLRO Bounding Sample Survey— samples PE2-RSYC8-U11-LLRO-S001 through PE2- RSYC8-U11-LLRO-S004 were collected from the edges of the 2'x2' over-excavation area surrounding LLRO #070318-1 and submitted for gamma spectroscopy analysis. Bounding soil sample locations and the over-excavation area are shown on the Bounding Sample Survey map (page 9). TestAmerica sample results are attached (pages 87-100).

Note: After the extraction of LLRO #070318-1, additional characterization was performed with the RSI unit. Evaluation of the LLRO spectral data indicates the presence of ^{226}Ra. Spectral analysis results are provided for LLRO #070318-1 (page 32).

All RSY material within the demarcated over-excavation area surrounding LLRO #070318-1 was removed and controlled as LLRW. Gamma Spectroscopy analysis results for bounding samples collected at the edges of the over-excavation are within project action limits.

Conclusions:

All locations with elevated Z-scores identified by the RSI gamma walkover survey were removed and controlled as a LLRW. 22 locations were investigated during the follow-up static survey, with one elevated reading exceeding the Reference Area static IL at location #22 where LLRO #070318-1 was identified. Spectral analysis results and gamma static data for each region of interest (ROI) are provided (pages 10-31).

Final analytical results for systematic samples from this RSY pad are concluded to be comparable to background. Histograms showing soil sample activity concentrations are provided (pages 33-34). Ten percent of the systematic soil samples (two samples in total, PE2-RSYC8-U11-S001 & PE2-RSYC8-U11-S011) were also analyzed for total strontium, with concentrations less than the Project Action Limit of 0.331 pCi/g, as shown in the Soil Sample Data table (page 1).

RSY C8 (Use 11) contains soil from the chemically contaminated (Lead- greater than project action limit) over-excavation area of Freshwater Wetlands Survey Unit 05 (FW-05).

APTIM request RASO concurrence to release this soil as Non-LLRW.
Disposition: This soil shall be dispositioned as non-LLRW waste and to be disposed of off-site at a CERCLA landfill

RSI Data Evaluation Process

RS-700 Mobile Radiation Monitoring System

- Self-contained gamma-ray radiation detection and monitoring system
- (2) RSX-1 4-liter NaI(Tl) gamma detectors oriented perpendicular to the direction of travel (VD1 denotes both detectors summed; VD3 refers to the left detector; and VD4 refers to the right detector)
- Multi-Channel Analyzer, allowing for monitoring of energy-specific regions of interest (ROIs)
- RadAssist survey software for control, monitoring, and recording

Ten ROIs have been established for radium and progeny, cesium, and cobalt, as well as other naturally-occurring or anthropogenic gamma-emitting radionuclides that may be of interest:

ROI	Description	Energy Range (keV)	Primary Peak (keV)
1	Total counts	411 – 2811	N/A
2	Potassium	1371 – 1569	1460
3	U/Ra-226	1659 – 1860	1764 (Bi-214)
4	Thorium	2409 – 2811	2614 (Tl-208)
5	Annihilation	456 – 570	511
6	Ra-226	546 – 666	609 (Bi-214)
7	Cs-137	600 - 720	662
8	Pb-214/Ra-226	327 – 399	351
9	Co-60	1085 - 1370	1173/1332
10	Gross Counts	24 – 2811	N/A

A tiered approach is used during data review to identify follow-up locations. Raw data are exported to a comma delimited format using RadAsssist and imported into an Excel spreadsheet for review and analysis. The following review steps are completed to determine if additional follow-up measurements are necessary:

- Playback Review: The data file is replayed in RadAssist and reviewed for elevated count rates in ROIs 6, 7, 9, and 10 for virtual detector (VD) 1 (both detectors summed). The scan screen is also monitored for elevated count rates and alarms.
- Count Rate Time Series Review: The count rates for ROIs 6, 7, 9, and 10 for VDs 1, 3 (detector 1), and 4 (detector 2) are plotted in a time series and reviewed for additional peaks in count rate.
- All ROIs:
    - Z-Scores: The Z-Scores are calculated for each location in all ROIs for VDs 1, 3, and 4. Any location with four or more ROIs having a Z-Score greater than three (Z>3) is marked for follow-up.
    - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in all ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with four or more ROIs having a local Z>3 is marked for follow-up.
    - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with four or more ROIs having a semi-local Z>3 is marked for follow-up.
- ROIs 3, 6, 8, and 10 (radium-specific ROIs):
    - Z-Scores: The Z-Scores are calculated for each location in the radium-specific ROIs for VDs 1, 3, and 4. Any location with three or more radium-specific ROIs having a Z>3 is marked for follow-up.
    - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in the radium-specific ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a local Z>3 is marked for follow-up.
    - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise

be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a semi-local Z>3 is marked for follow-up.

- ROI 7 (cesium-specific ROI):
  - Z-Scores: Z-Scores are calculated for each location in ROI 7 for VDs 1, 3, and 4. Any location having a Z>3 is marked for follow-up.
  - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 7 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local Z>3 is marked for follow-up.
  - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 7 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local Z>3 is marked for follow-up.
- ROI 9 (cobalt-specific ROI):
  - Z-Scores: Z-Scores are calculated for each location in ROI 9 for VDs 1, 3, and 4. Any location having a Z>3 is marked for follow-up.
  - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 9 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local Z>3 is marked for follow-up.
  - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 9 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local Z>3 is marked for follow-up.

- Z-Score Time Series Review: The three types of Z-Scores for ROIs 6, 7, 9, and 10 for VDs 1, 3, and 4 are plotted in a time series and reviewed for additional peaks in Z-Scores.

Any location selected for follow-up or with a Z-Score > 3 in a radium-, cesium-, or cobalt-specific ROI will undergo spectral analysis to determine if it is statistically likely that there are ROC concentrations present at that location in quantities greater than background.

A background spectrum is subtracted from the local spectral data for a given location, and the resulting net spectrum is plotted. Critical levels, as defined in Section 6.7.1 of the Multi Agency Radiation Survey and Site Investigation Manual are calculated and plotted based on background levels. The critical level is the level, in counts, at which there is a statistical probability (with a predetermined confidence) of incorrectly identifying a measurement system background value as greater than background. Any response above this level is considered to be greater than background. The critical level is calculated for ROIs 6, 7, 8, and 9 according to the equation shown below:

$$LC = 2.33\sqrt{B}$$

Where:

LC = critical level (counts)

B = average background in the ROI

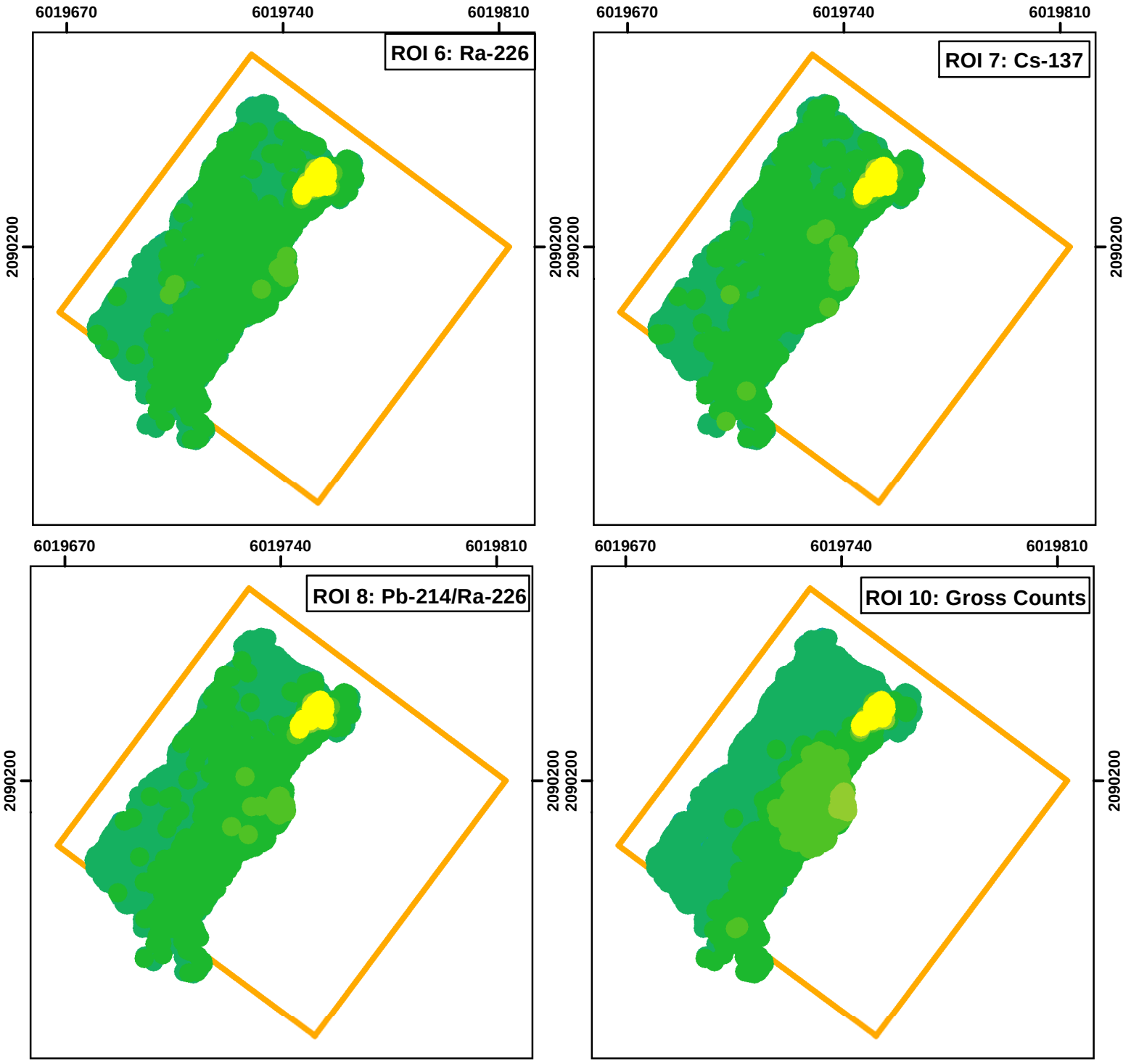
When count rates in the net gamma spectrum at a given location do not exceed critical levels for any radium-, cesium-, or cobalt-specific energy ranges, it is unlikely that ROC concentrations exist at that location above background.

Any data point that is both above the critical level and within the energy range of a given ROI is considered above background for that radionuclide and will be flagged for further investigation in the field.

Contour Map

HPNS Parcel E-2
RSY Pad C8 (Use 11)

Soil Excavation Site:
FW Lead Overexcavation



RS 700 Gamma Walkover Survey Data (VD1)

- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev
- RSY Pad Boundaries

0 20 40 80 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

APTIM

C:\Users\amy.meldrum\Desktop\RSYC8 - Use 11\RSYC8Use11_ContourMap.mxd

RSI Review Summary

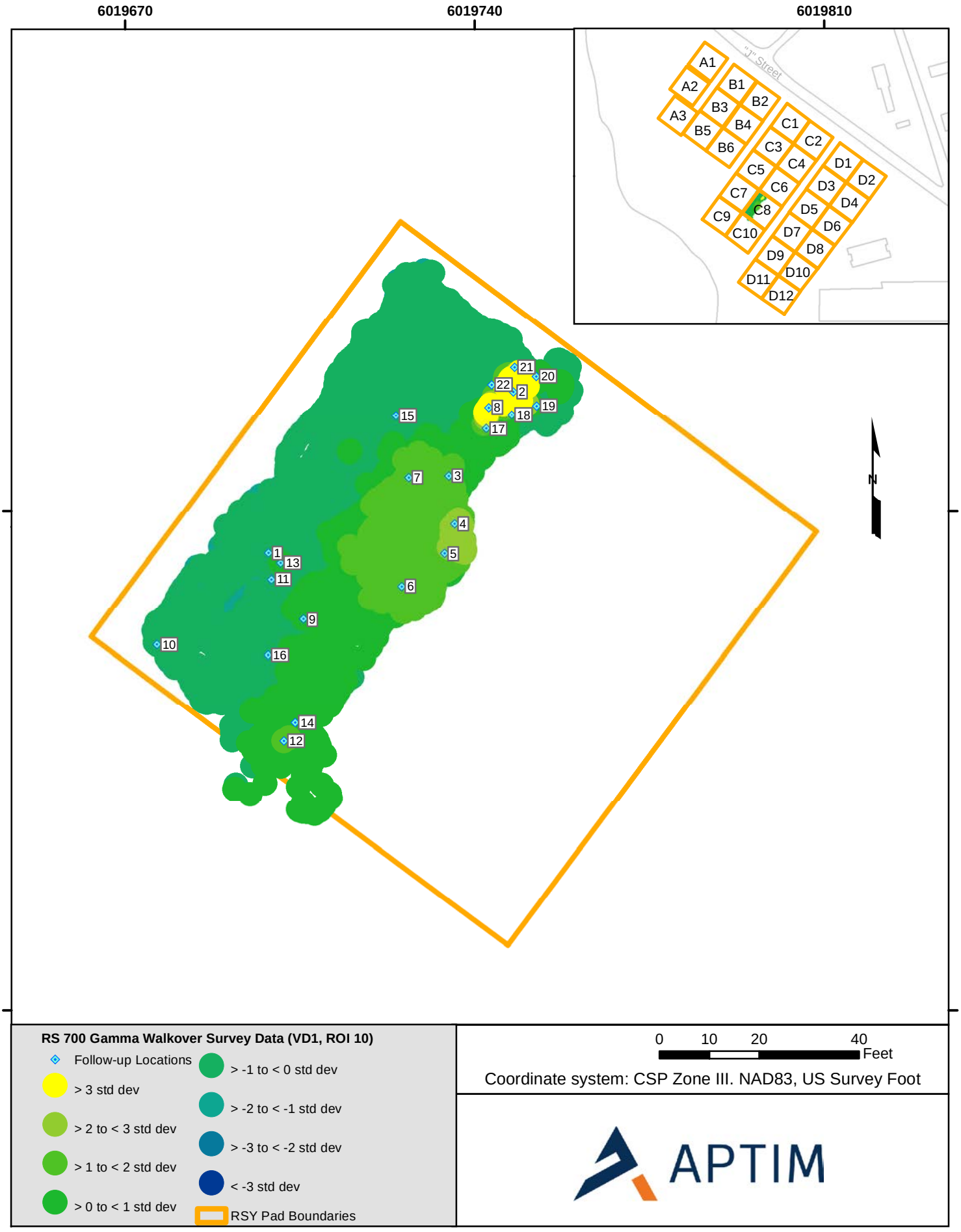
Summary:

22 locations were initially selected for follow-up investigation. Locations were identified by elevated peaks noted in the playback review and/or time series charts, and by using the Z-Score, Local Z-Score, and Semi-Local Z-Score reviews as described in the RSI Data Evaluation Process on pages 3-4. Spectral analyses performed on gamma static data at location #22(LLRO #070318-1) indicated the presence of ^{226}Ra and ^{137}Cs above background. Elevated activity in this follow-up location is associated with the identified LLRO. All other gamma static readings at follow-up locations were less than the Reference Area static IL for ROIs 3, 6, 7, 8, and 10; figures for all locations are provided on pages 10-31.

RSI Follow-up Static Survey
HPRS-07022018-PE2-JSS2-2690

HPNS Parcel E-2
RSY Pad C8 (Use 11)

Soil Excavation Site:
FW-05 Lead Overexcacation

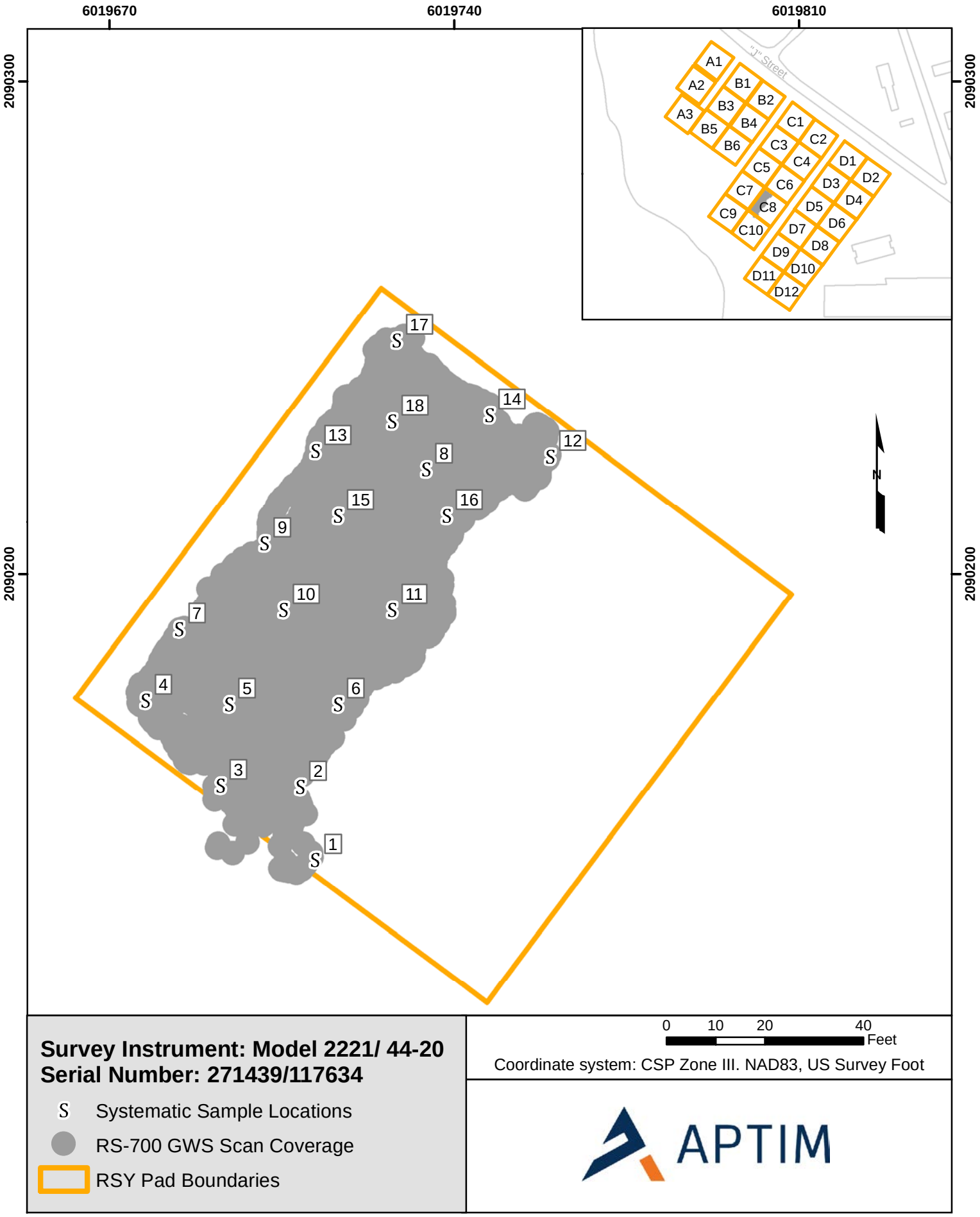


C:\Users\laura.whittaker\Desktop\RSY C8-Use11\HPRS-06282018-PE2-ROV2-2675 RSYC8 - Use 11 RSI Scan.mxd

Systematic Sample Survey
HPRS-06292018-PE2-JSS-2688
HPRS-07252018-PE2-JSS-2833

HPNS Parcel E-2
RSY Pad C8 (Use 11)

Soil Excavation Site:
FW-05 Lead Overexcacation



Survey Instrument: Model 2221/ 44-20
Serial Number: 271439/117634

S Systematic Sample Locations

RS-700 GWS Scan Coverage

RSY Pad Boundaries

Coordinate system: CSP Zone III. NAD83, US Survey Foot

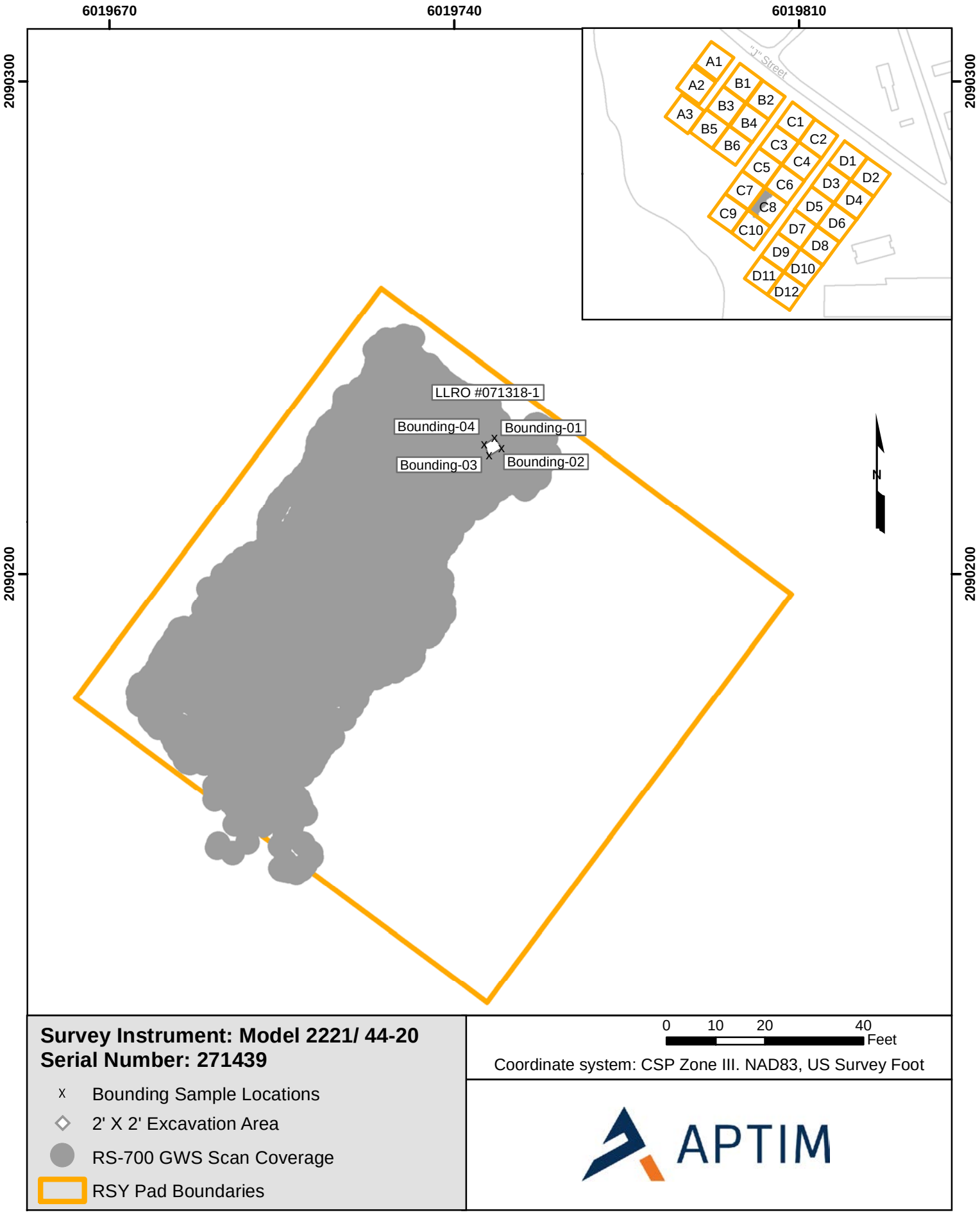
APTIM

C:\Users\laura.whittaker\Desktop\RSY C8-Use11\RSYC8-Use11-Systematic.mxd

Bounding Sample Survey
HPRS-07032018-PE2-JSS-2721

HPNS Parcel E-2
RSY Pad C8 (Use 11)

Soil Excavation Site:
FW-05 Lead Overexcacation



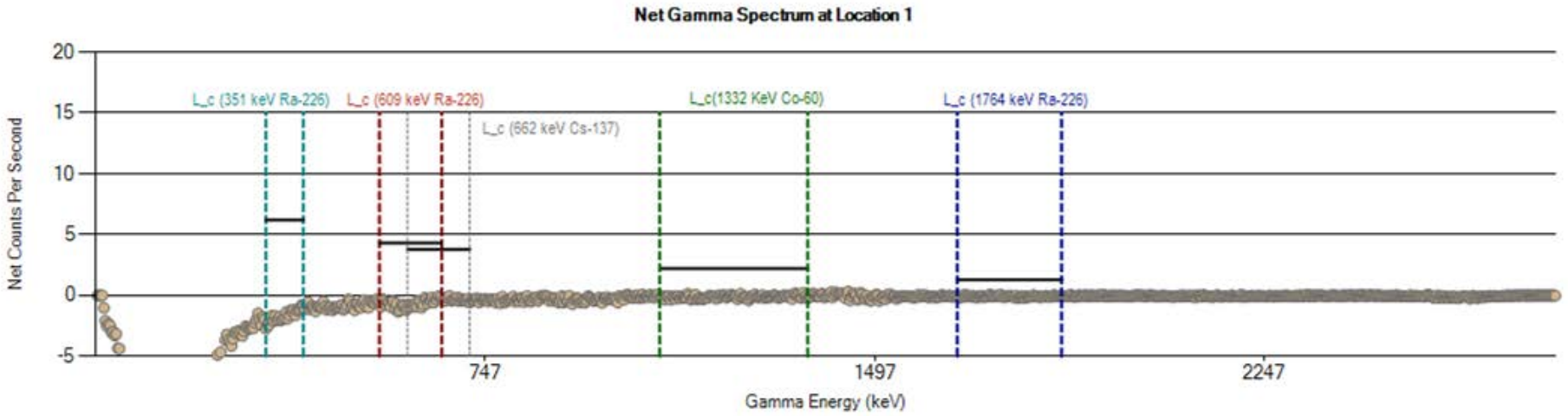
Survey Instrument: Model 2221/ 44-20
Serial Number: 271439

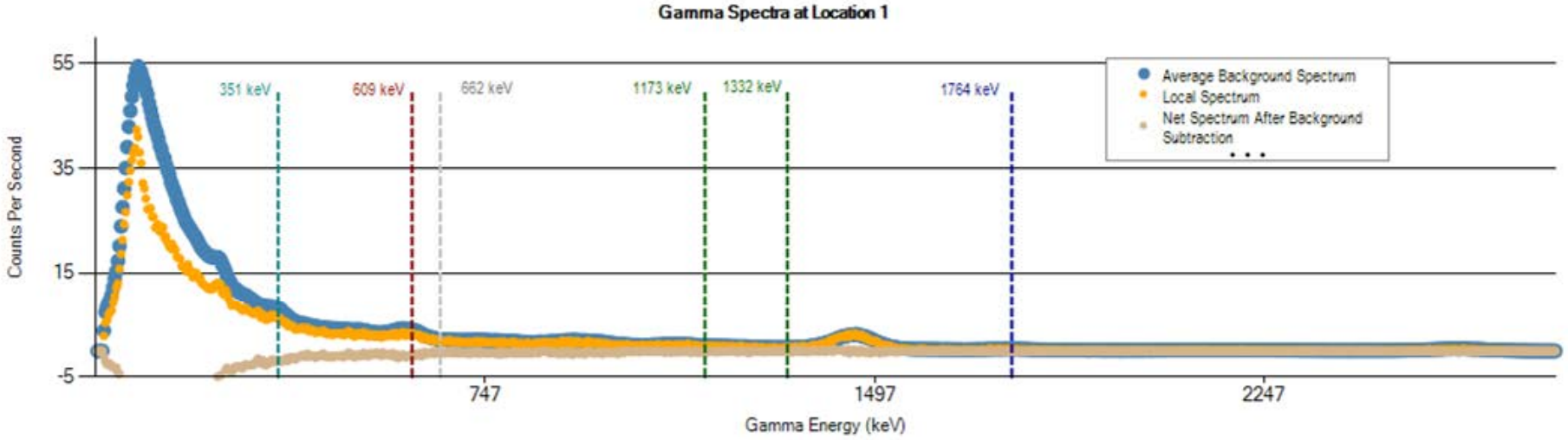
- X Bounding Sample Locations
- ◇ 2' X 2' Excavation Area
- RS-700 GWS Scan Coverage
- RSY Pad Boundaries

Coordinate system: CSP Zone III. NAD83, US Survey Foot

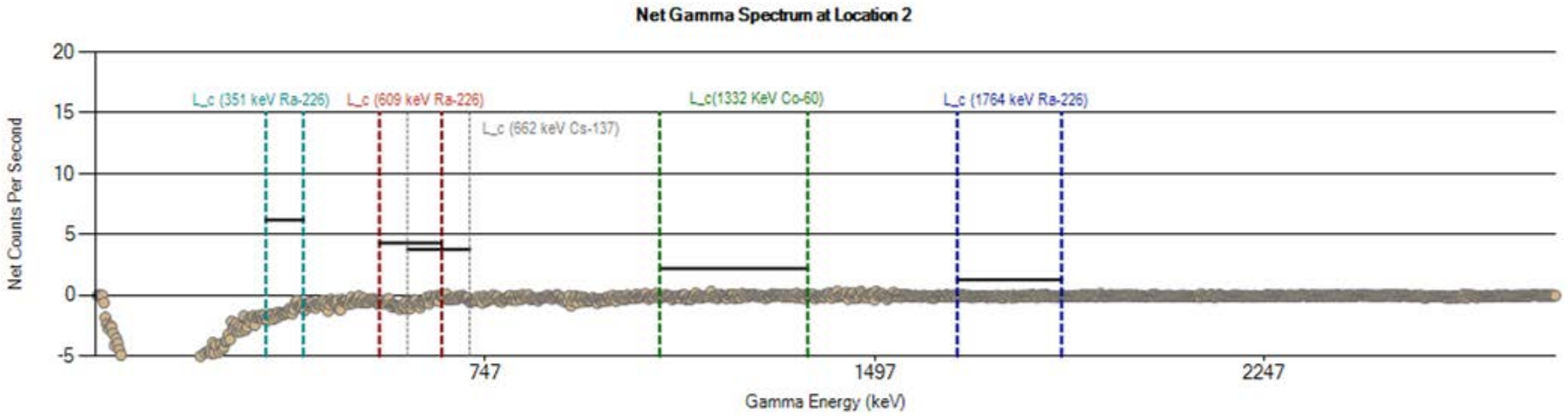
APTIM

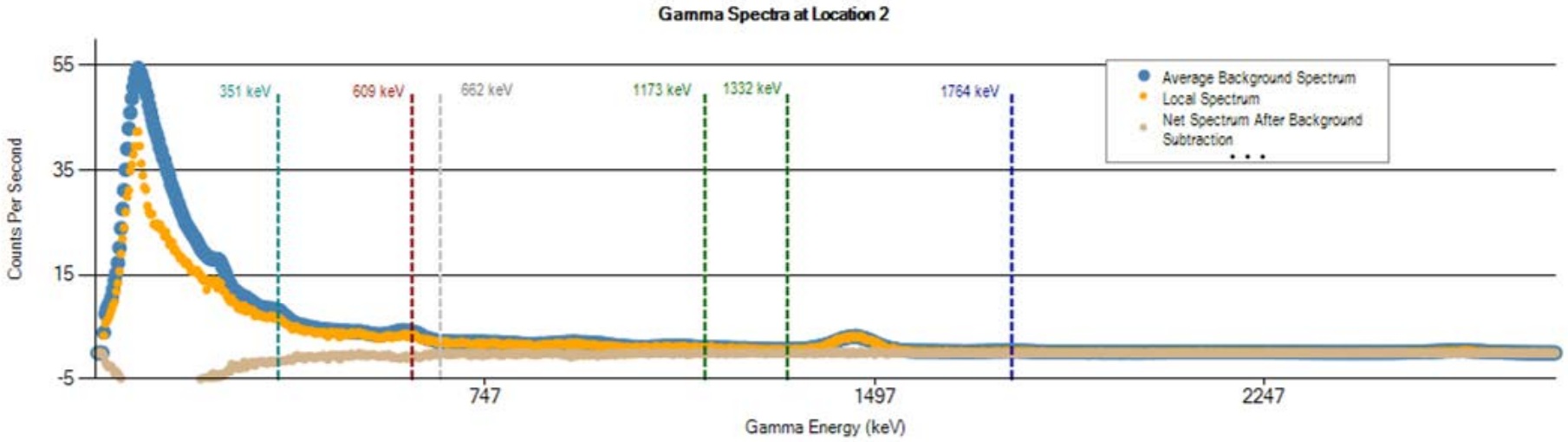
C:\Users\laura.whittaker\Desktop\RSY C8-Use11\RSYC8-Use11 LLRO Bounding.mxd



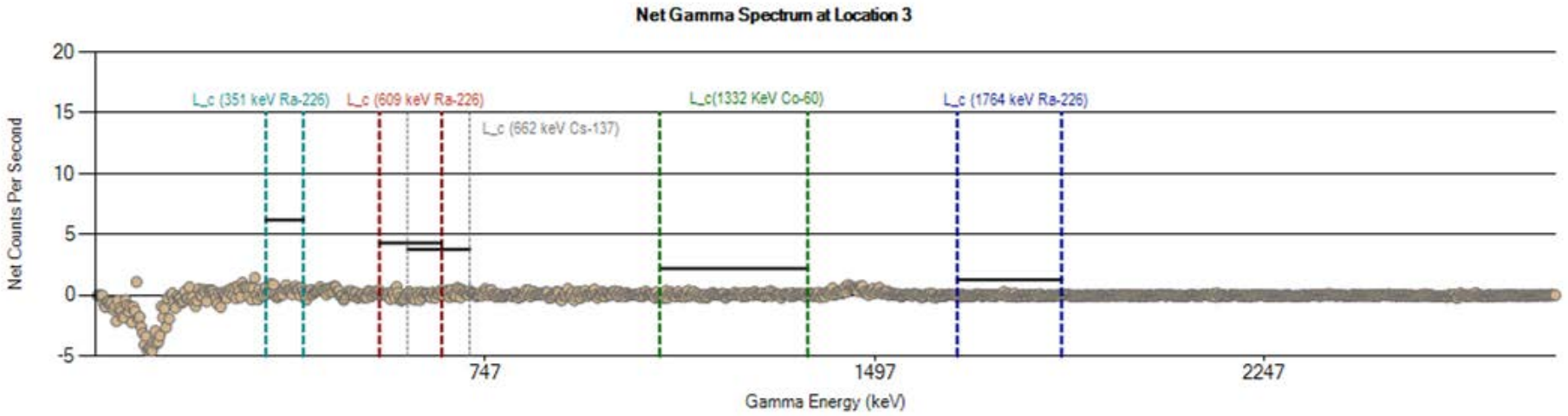


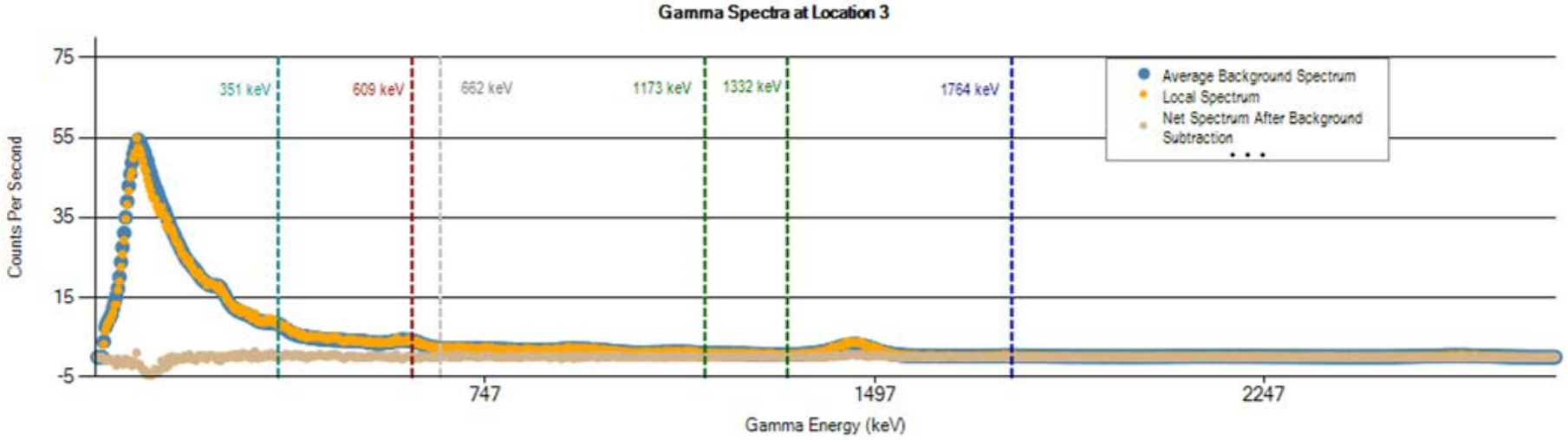
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 1 (cps)	715	111	15	17	123	114	89	134	78	2588
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



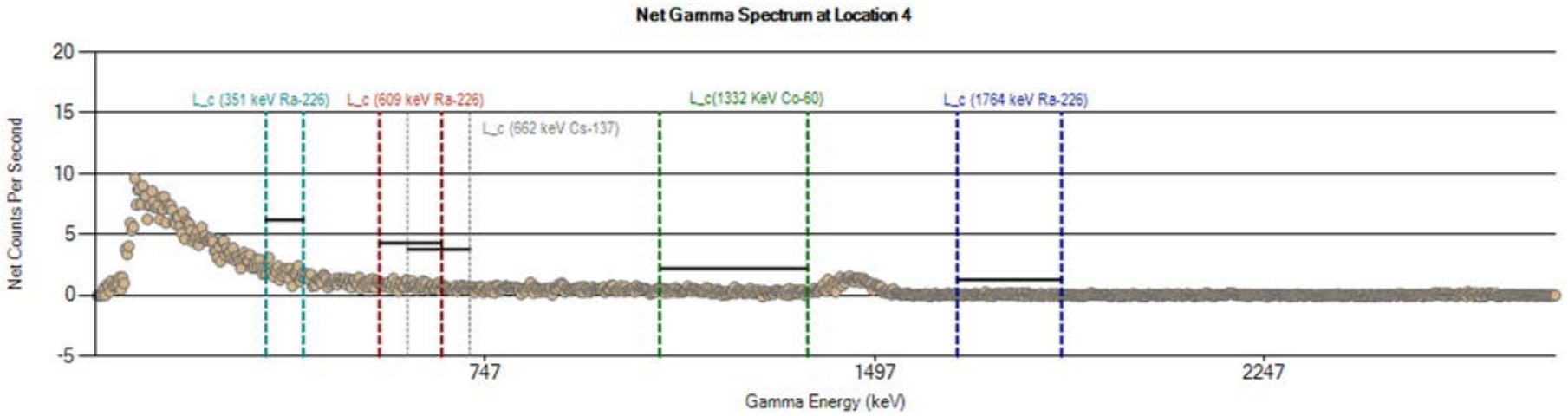


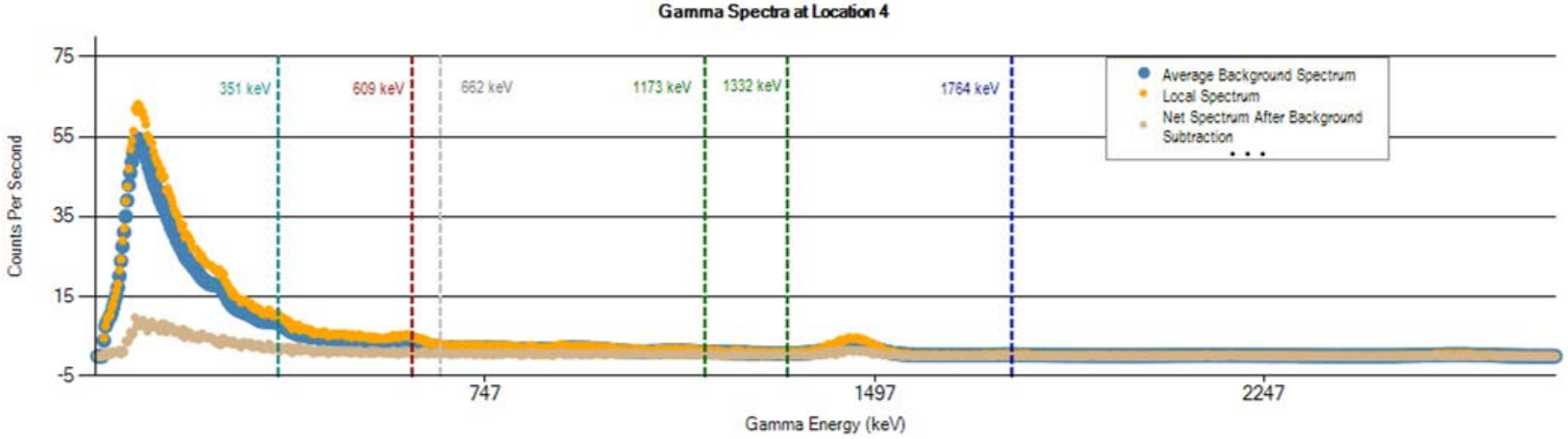
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 2 (cps)	748	115	16	19	131	117	93	141	83	2692
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



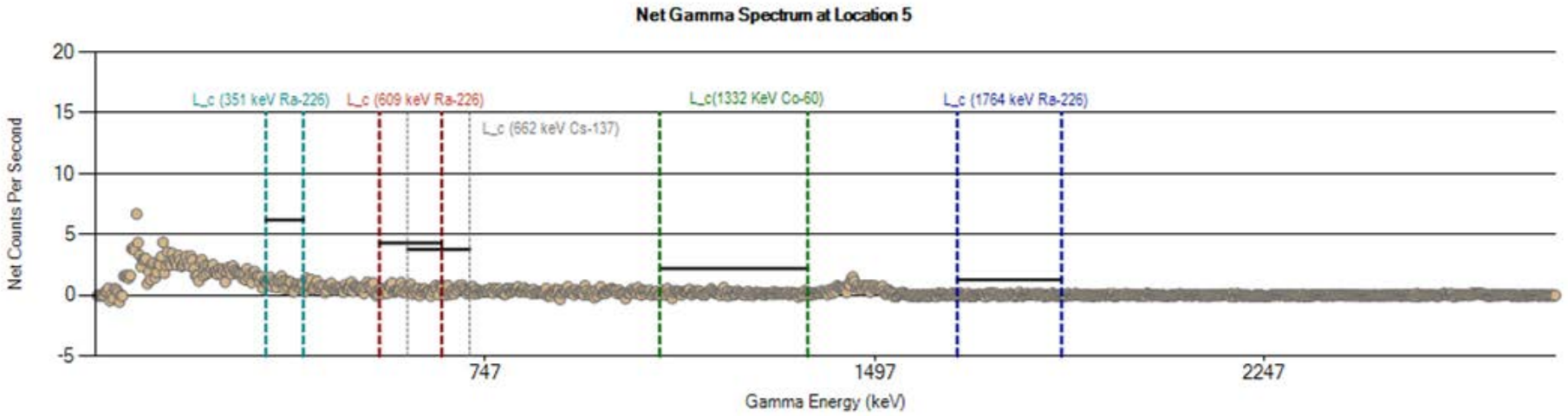


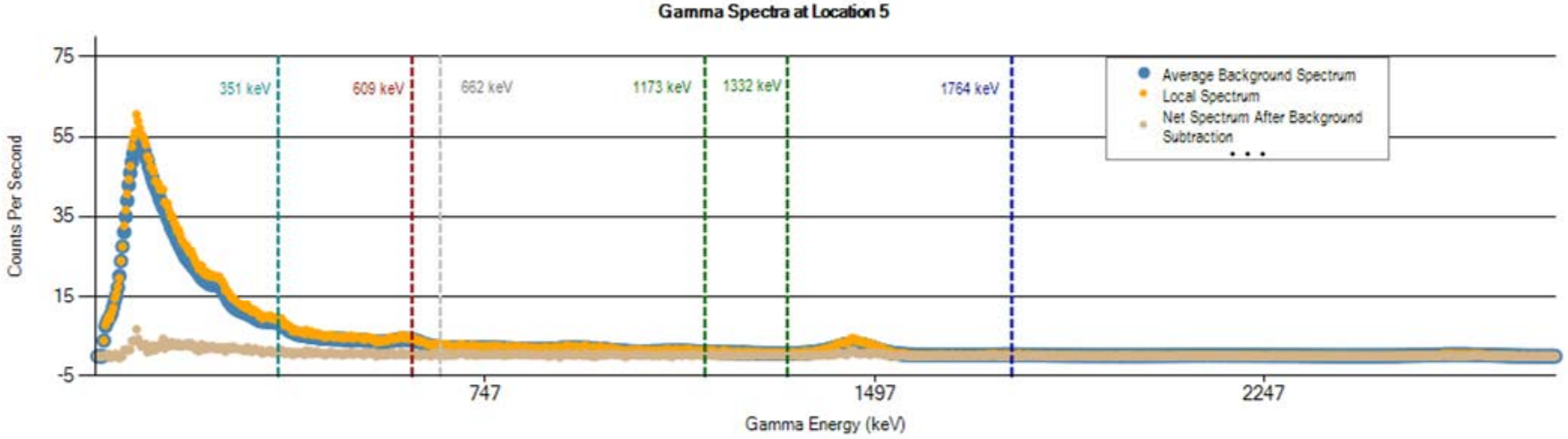
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 3 (cps)	902	131	21	23	156	141	112	183	95	3592
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



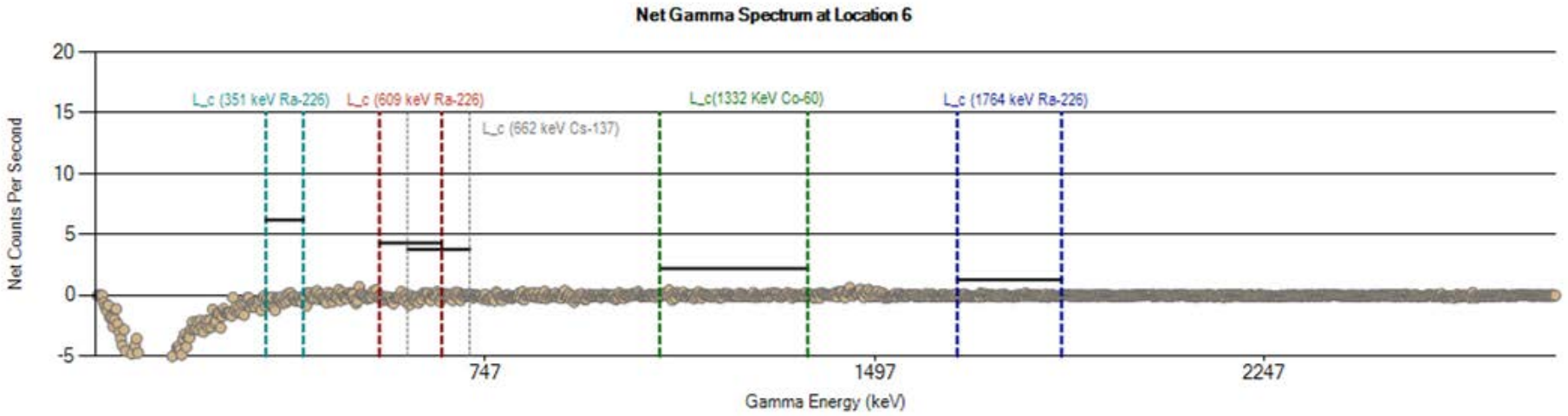


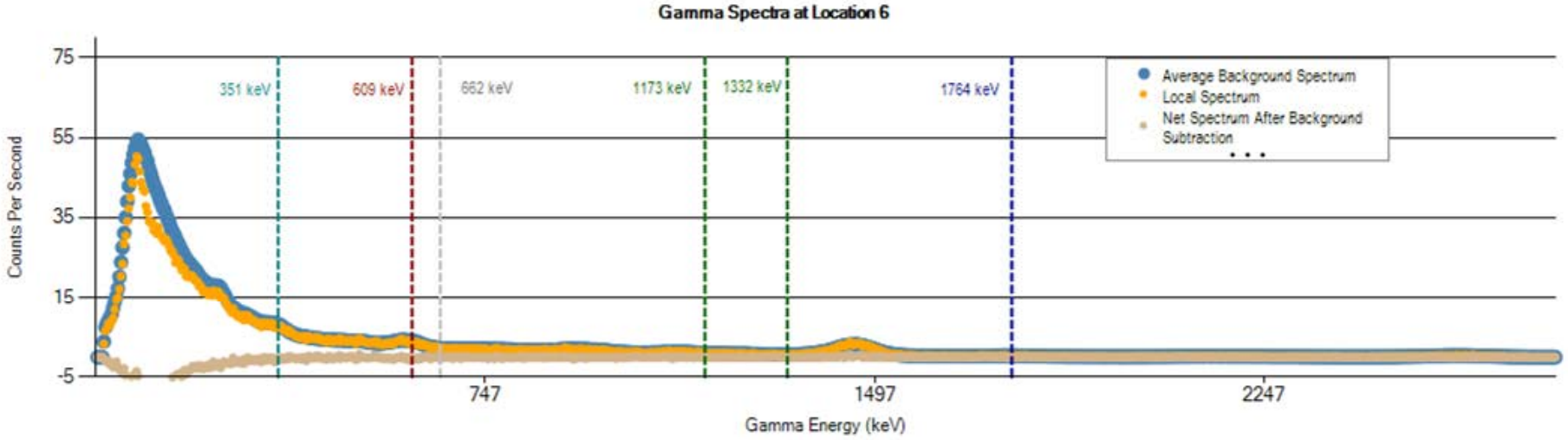
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 4 (cps)	1105	161	25	28	192	174	136	221	120	4383
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



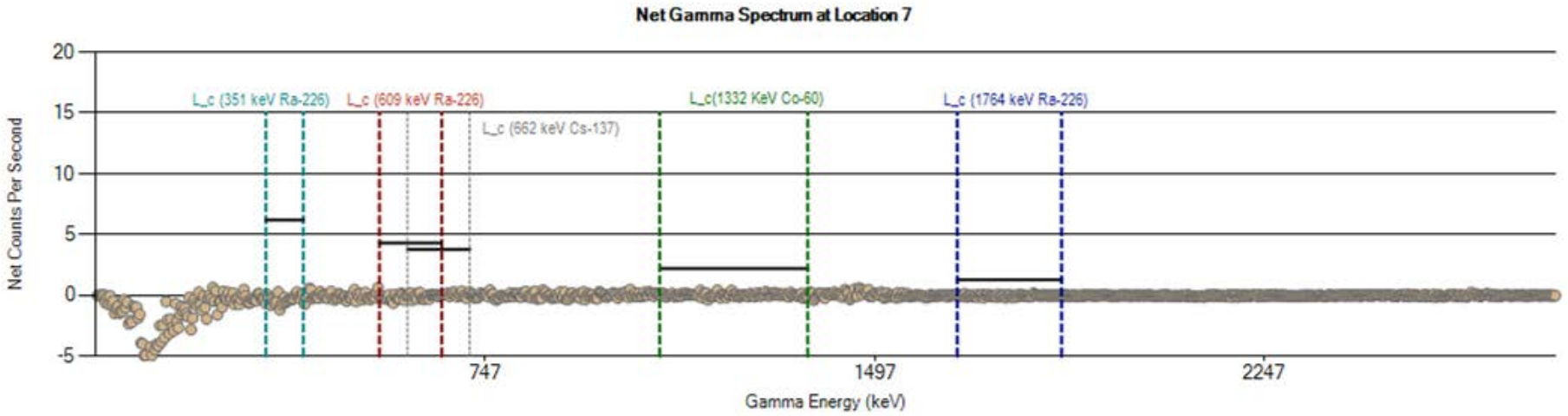


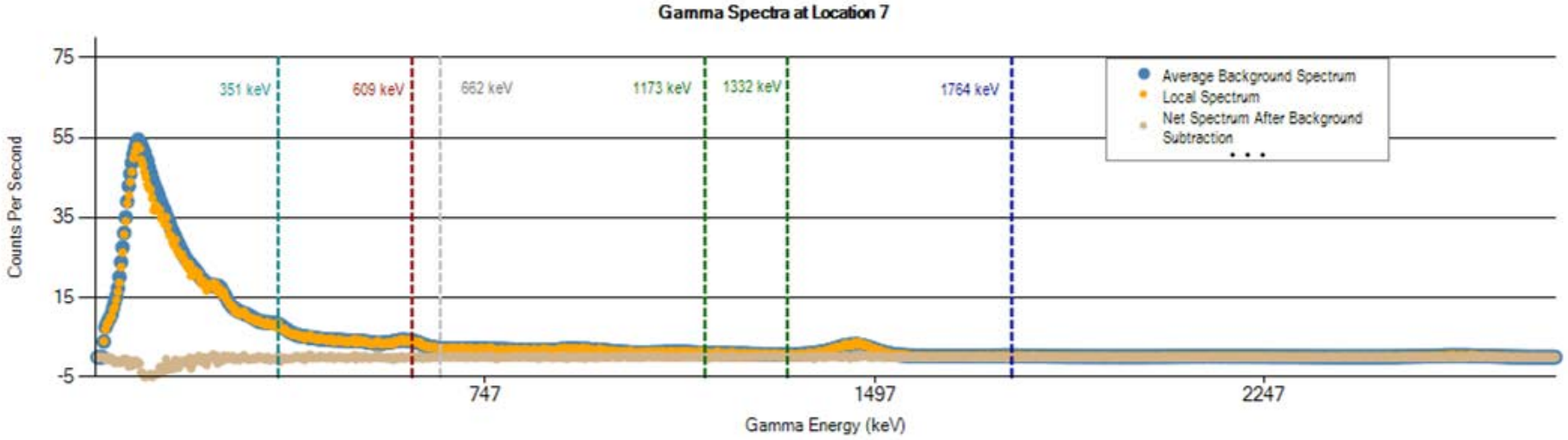
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 5 (cps)	1003	143	23	27	173	159	125	198	108	3995
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



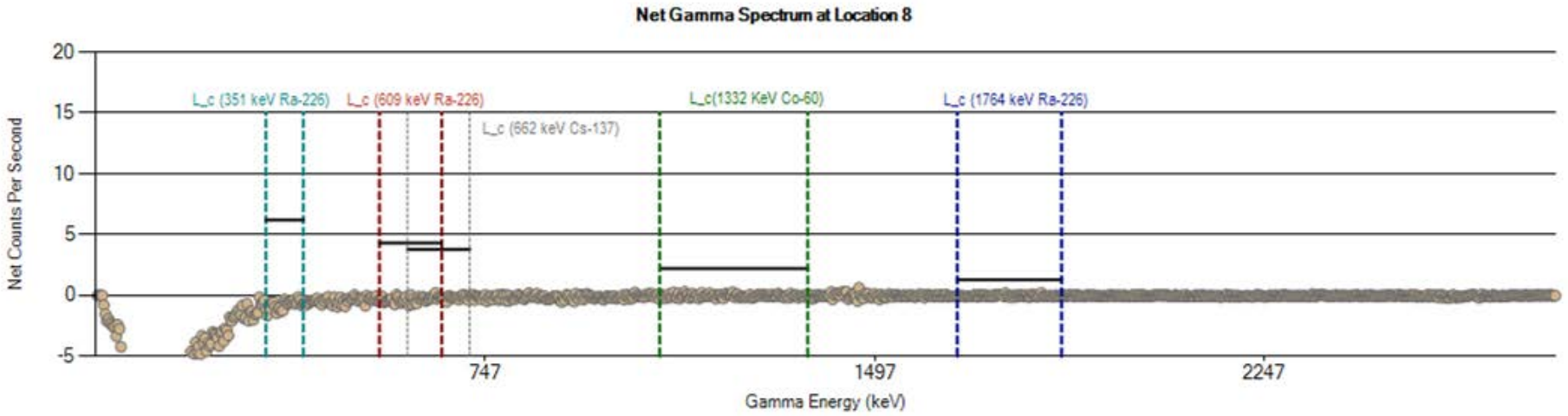


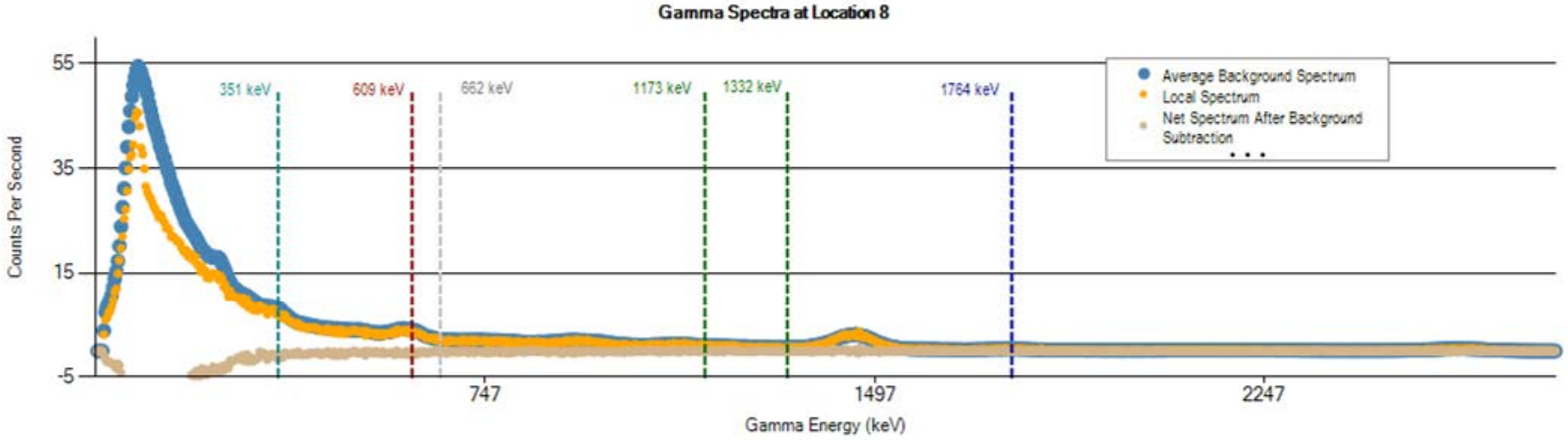
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 6 (cps)	838	120	19	21	148	133	104	166	90	3194
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



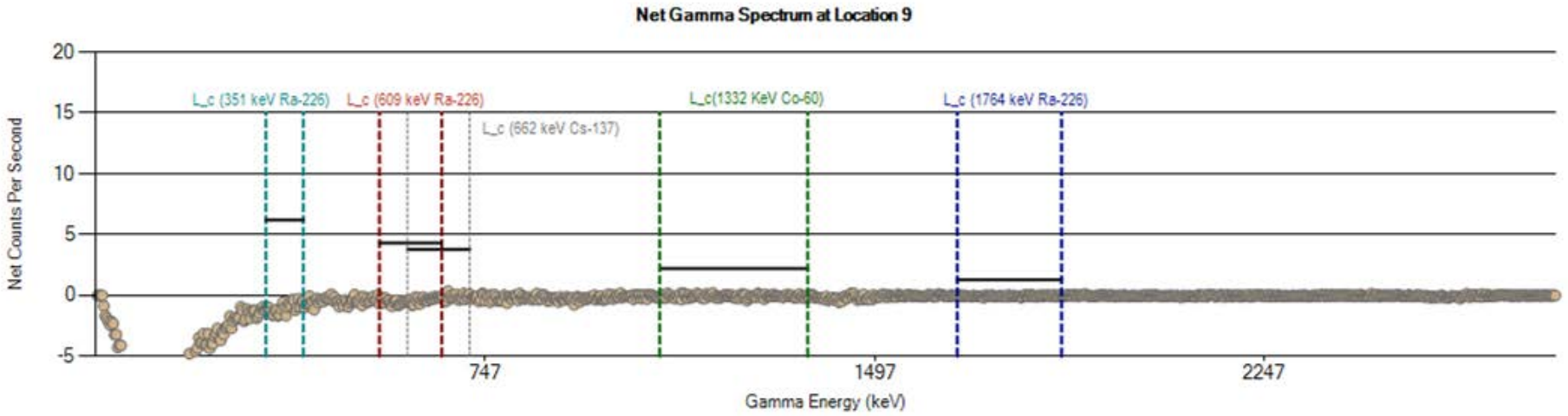


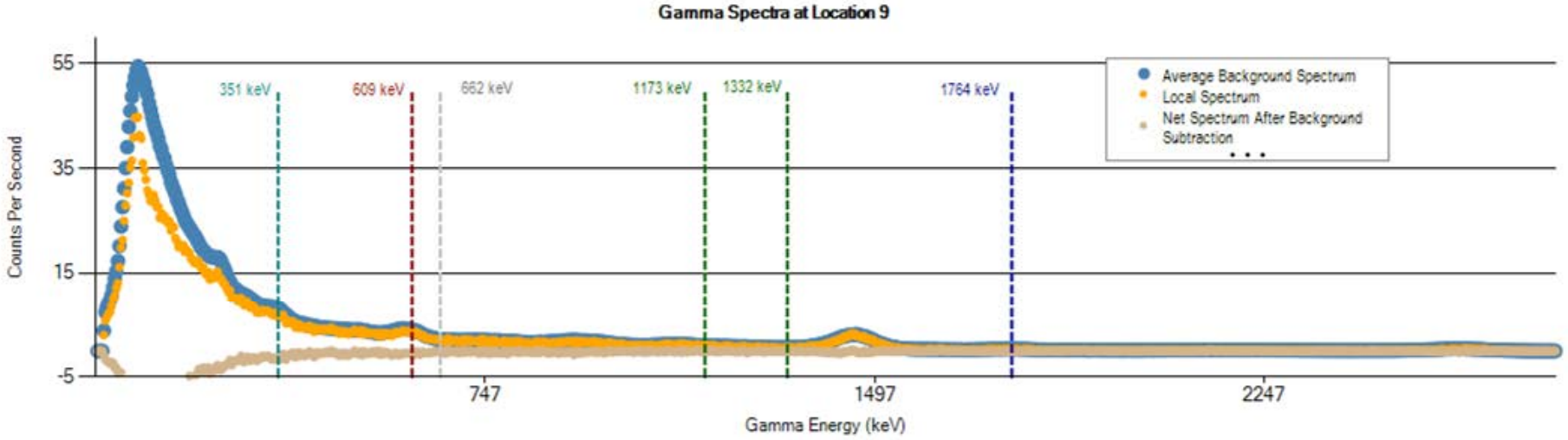
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 7 (cps)	856	120	19	24	147	136	108	166	93	3463
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



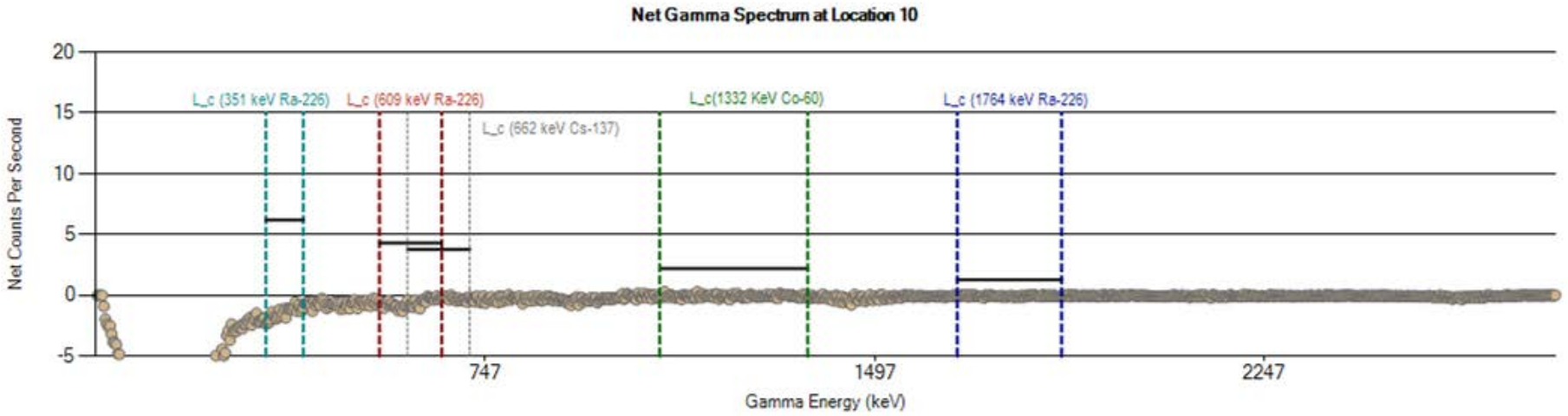


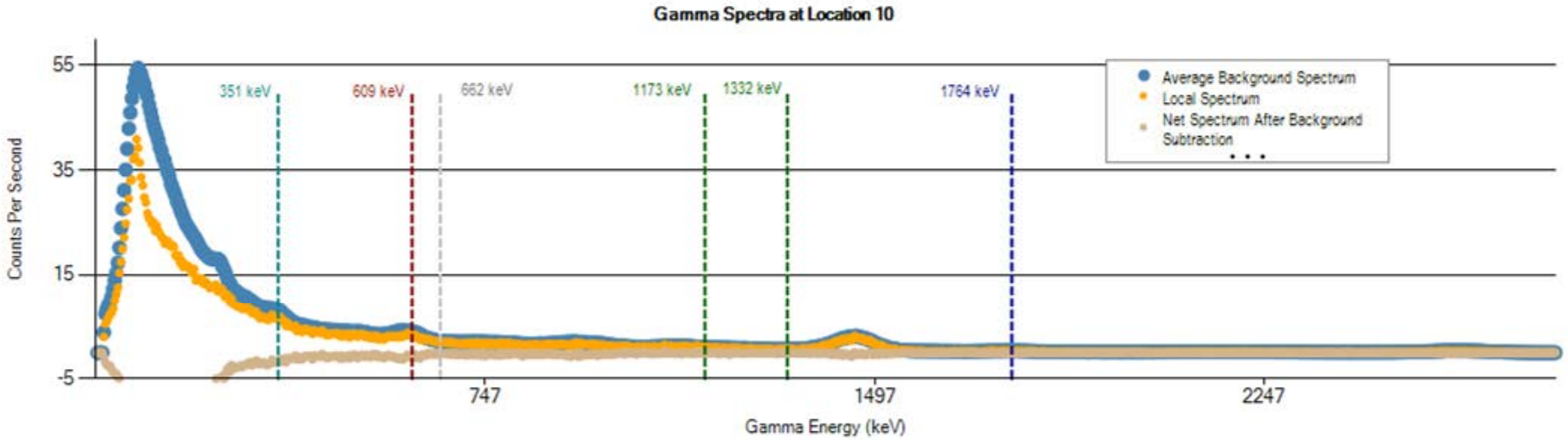
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 8 (cps)	788	114	19	20	137	127	98	155	86	2893
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



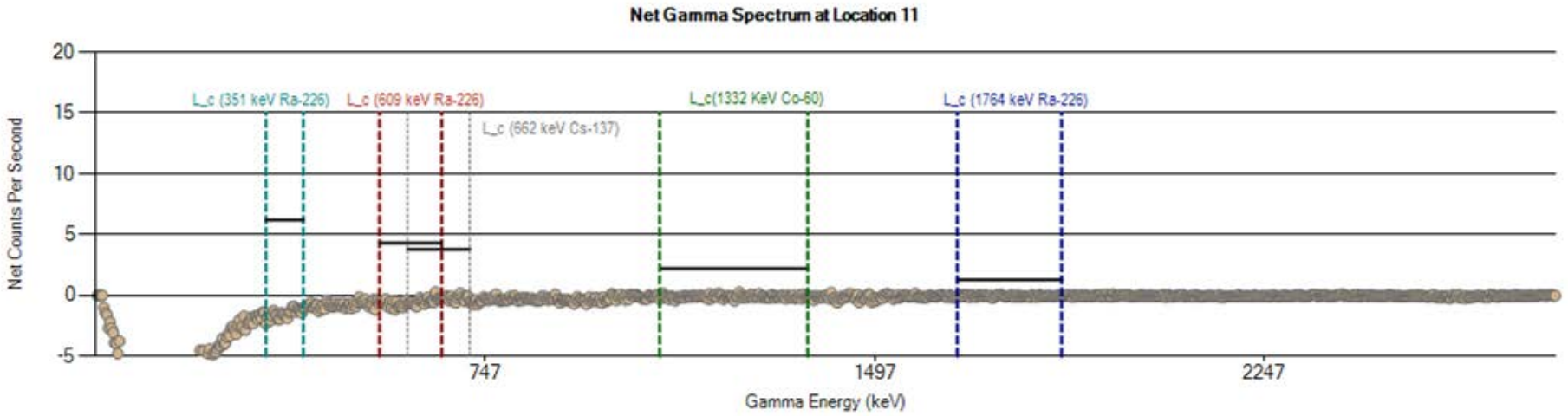


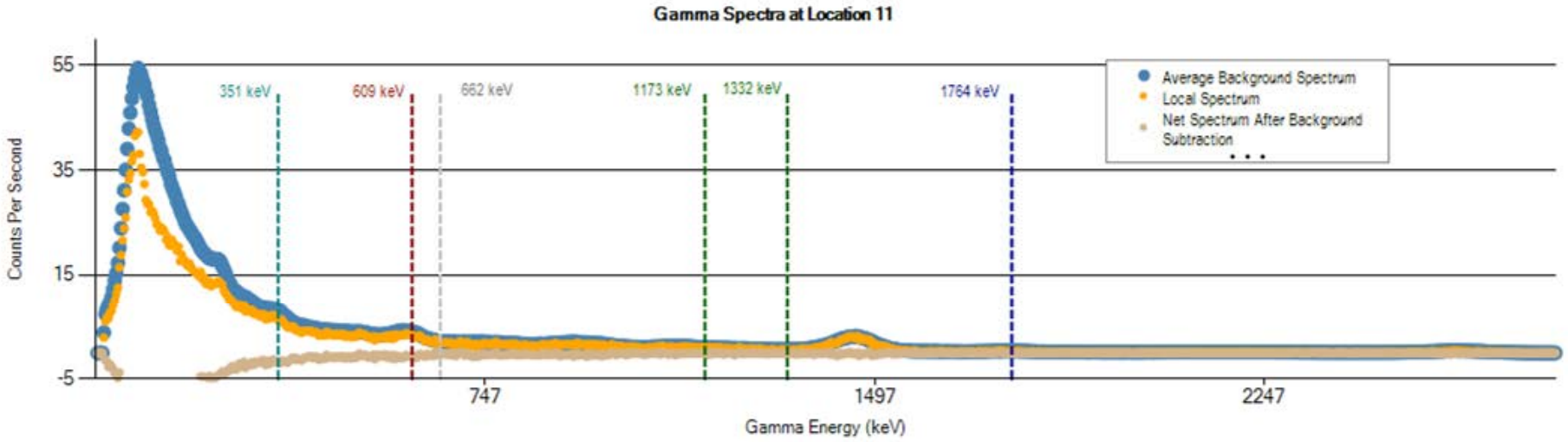
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 9 (cps)	767	106	17	20	134	124	97	149	82	2872
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



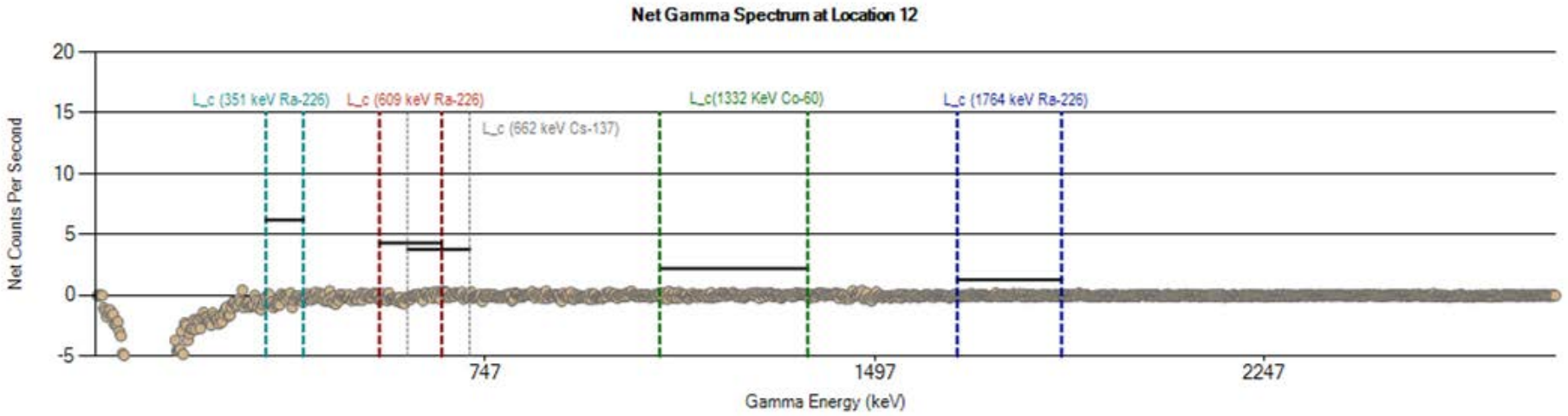


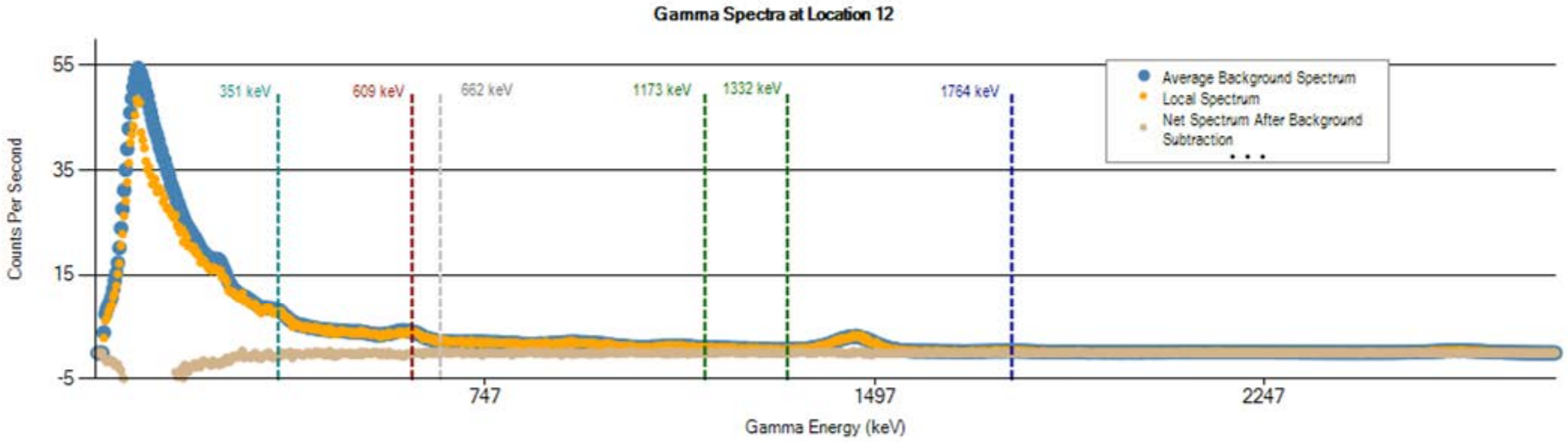
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 10 (cps)	725	103	17	16	125	115	92	140	83	2587
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



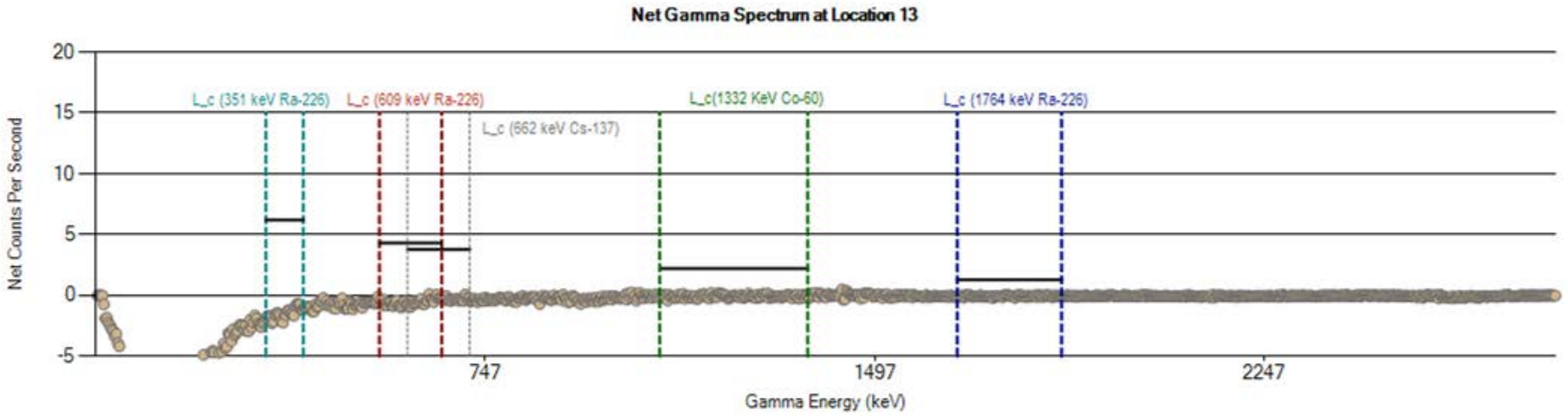


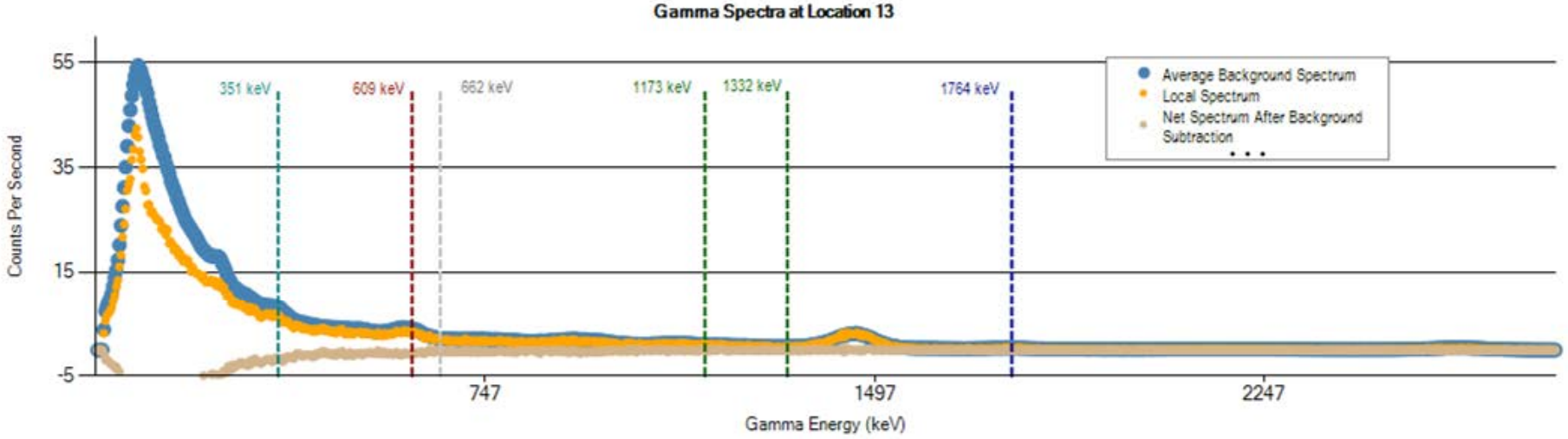
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 11 (cps)	725	106	17	18	125	118	93	138	79	2677
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



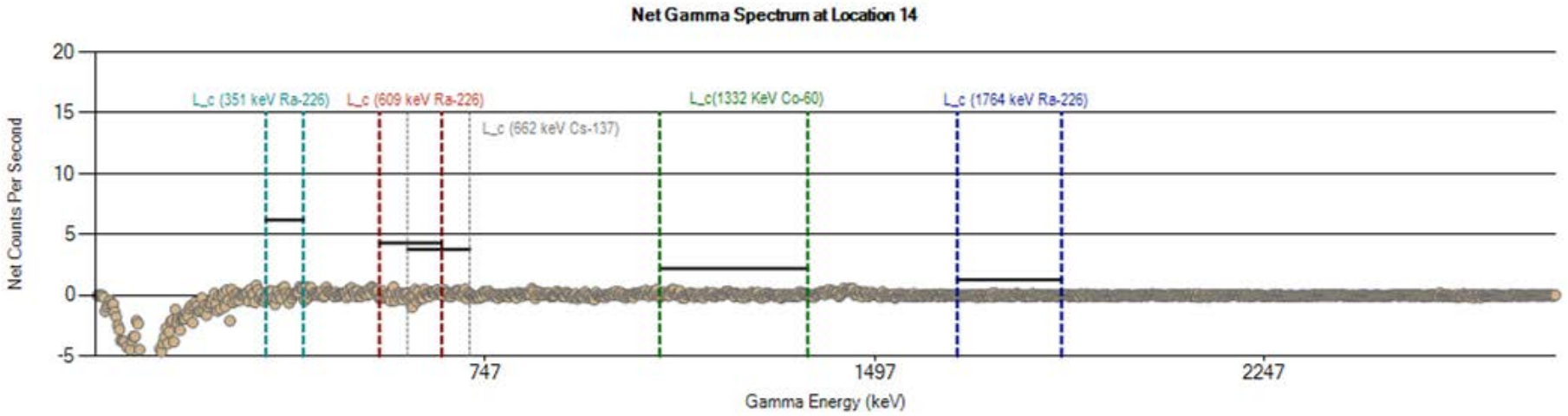


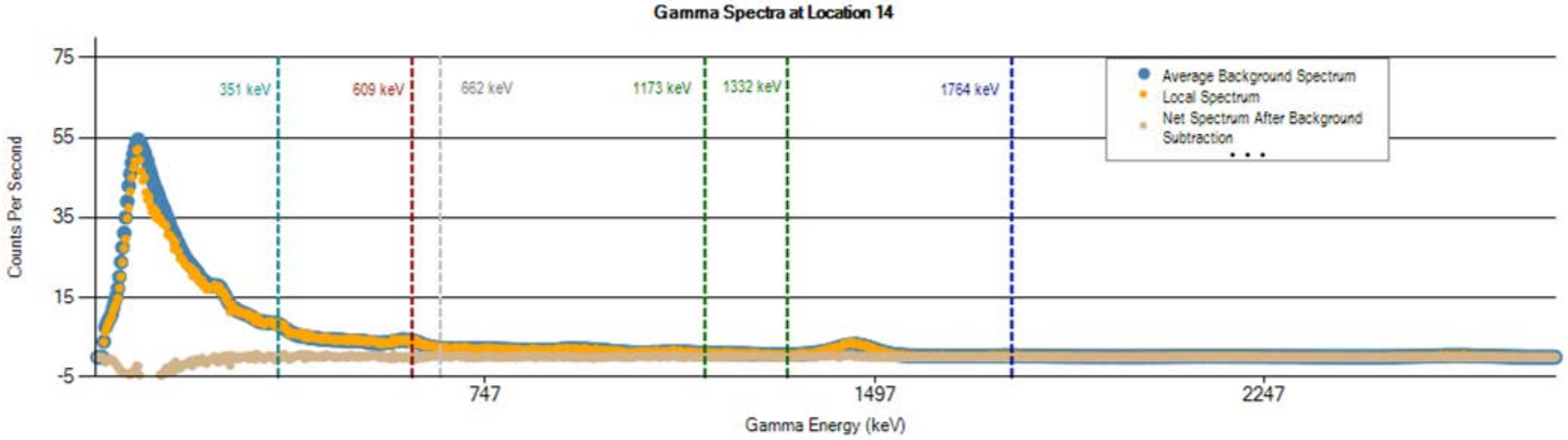
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 12 (cps)	835	114	20	22	146	135	108	165	89	3181
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



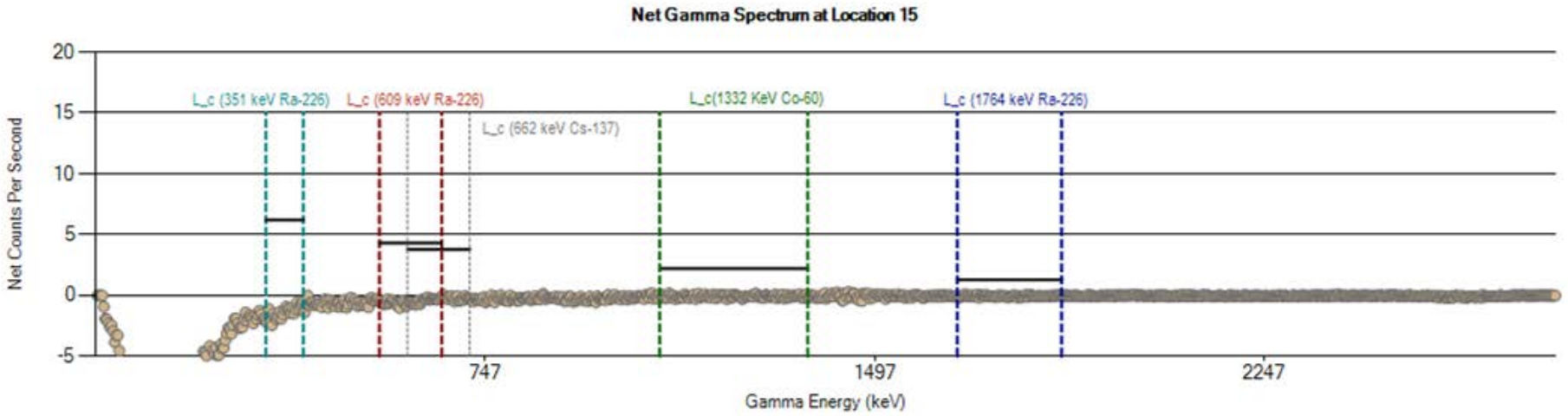


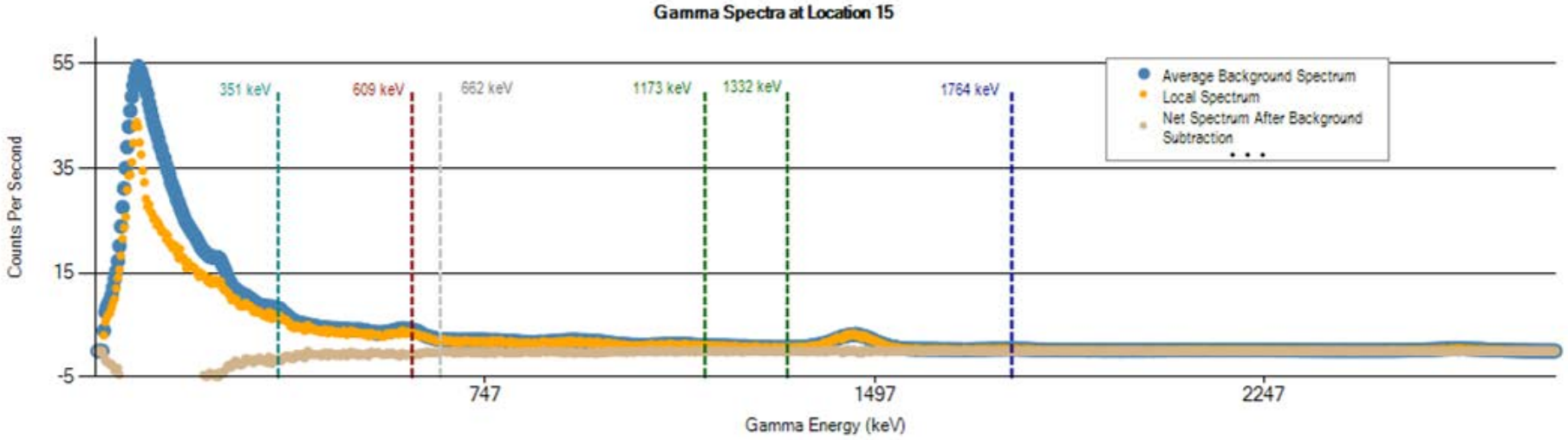
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 13 (cps)	740	115	17	17	125	118	92	138	82	2660
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



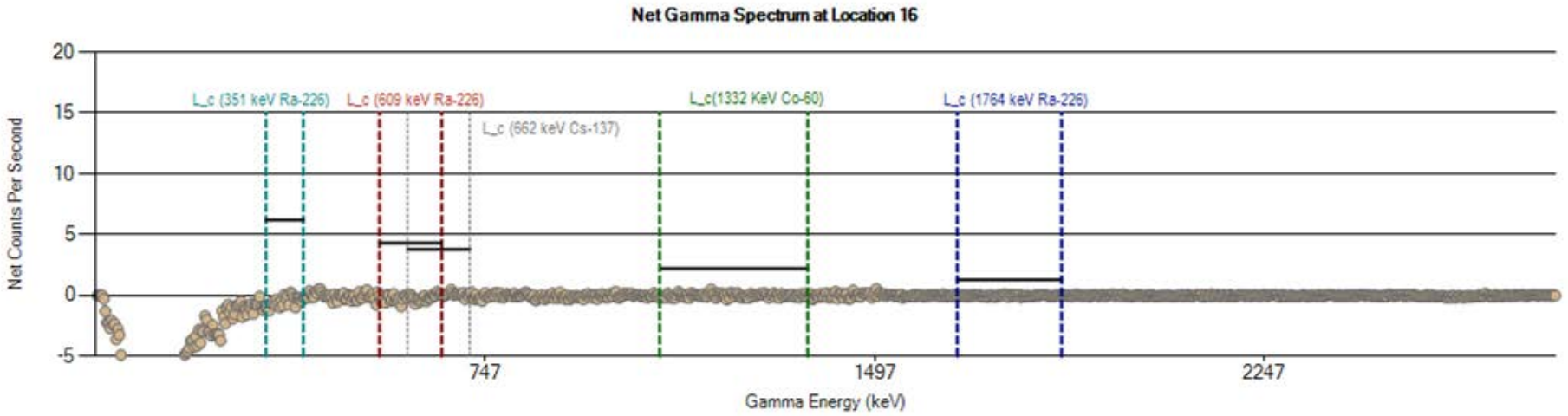


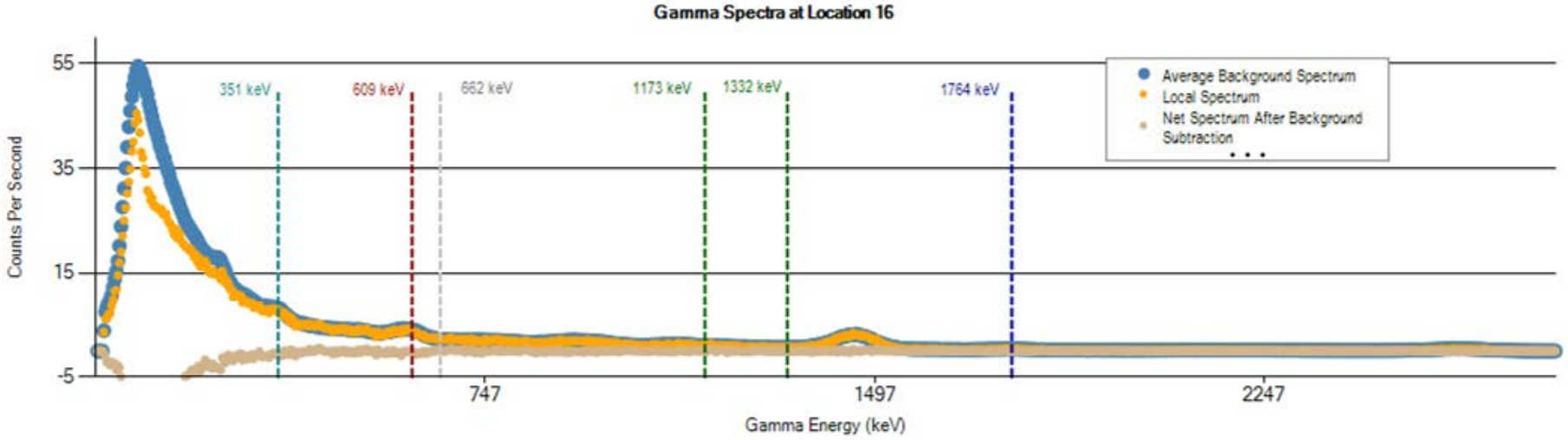
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 14 (cps)	886	123	20	23	157	141	111	177	94	3424
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



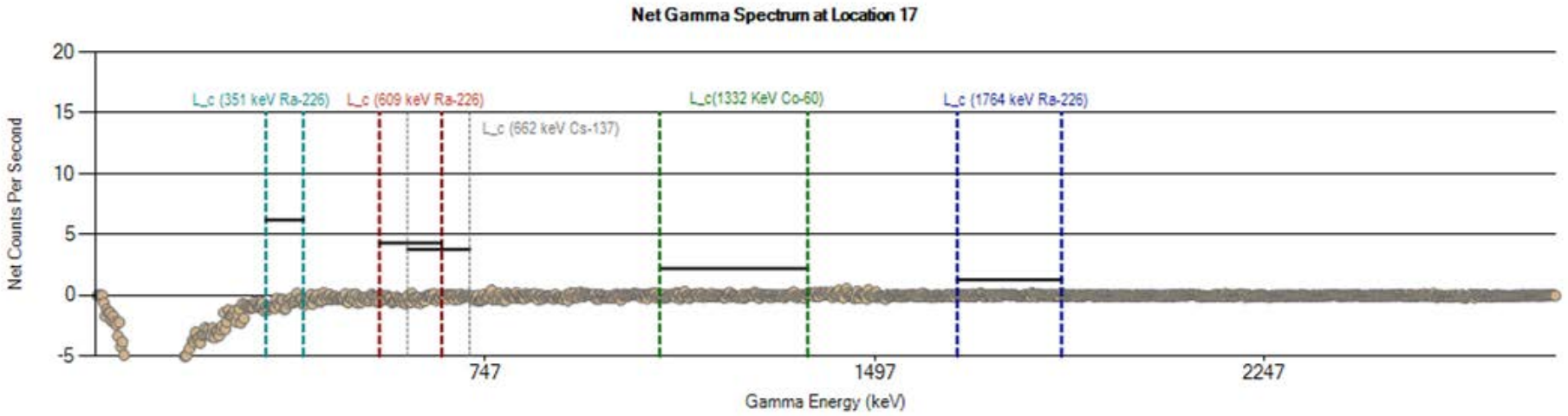


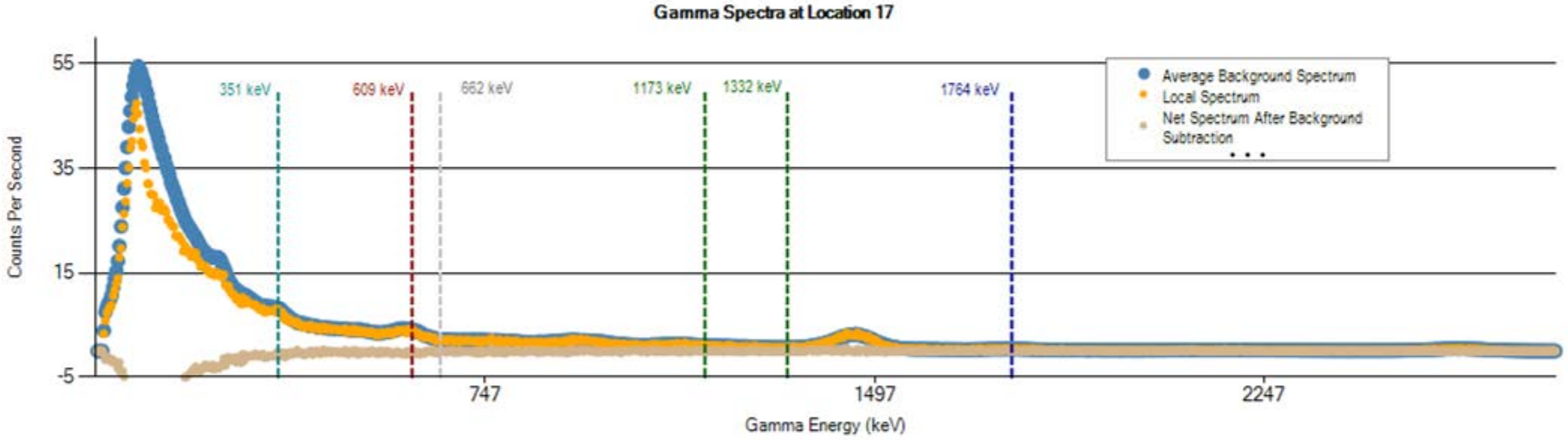
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 15 (cps)	749	112	17	18	129	120	94	140	81	2703
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



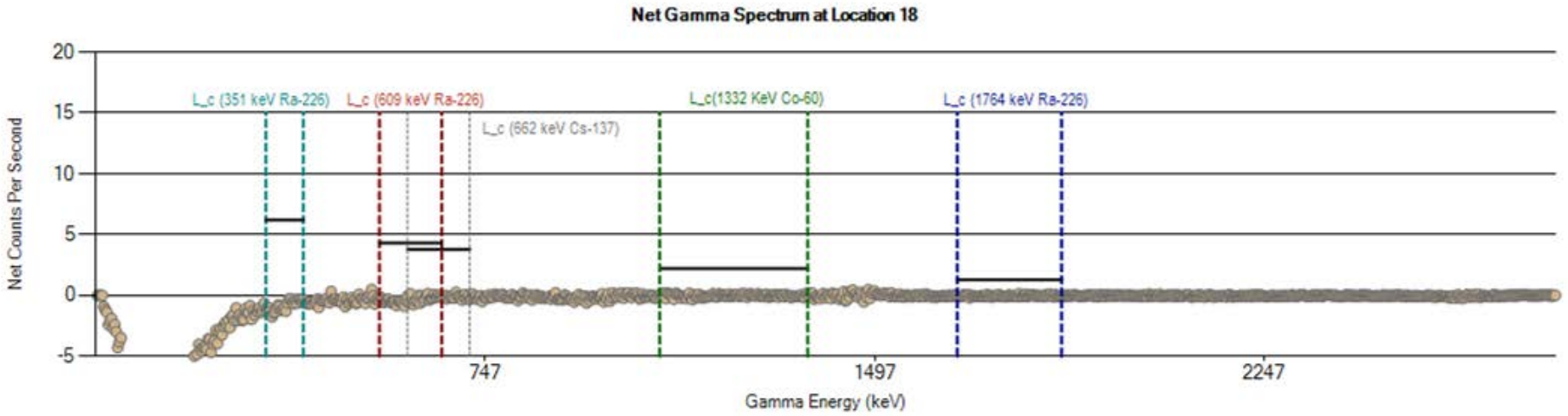


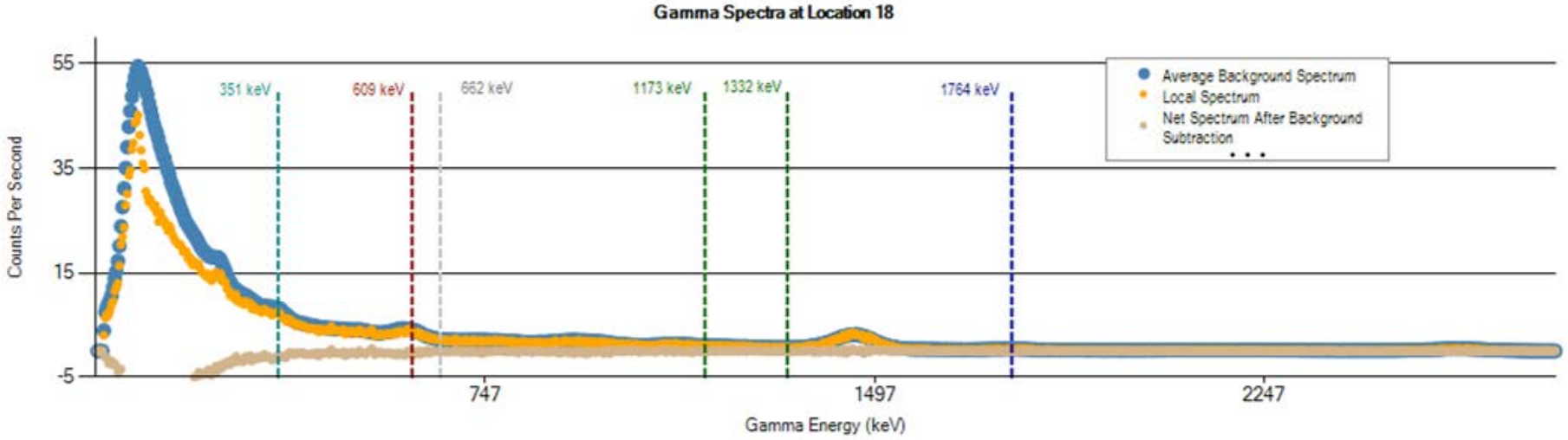
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 16 (cps)	835	116	19	21	146	132	106	163	89	3007
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



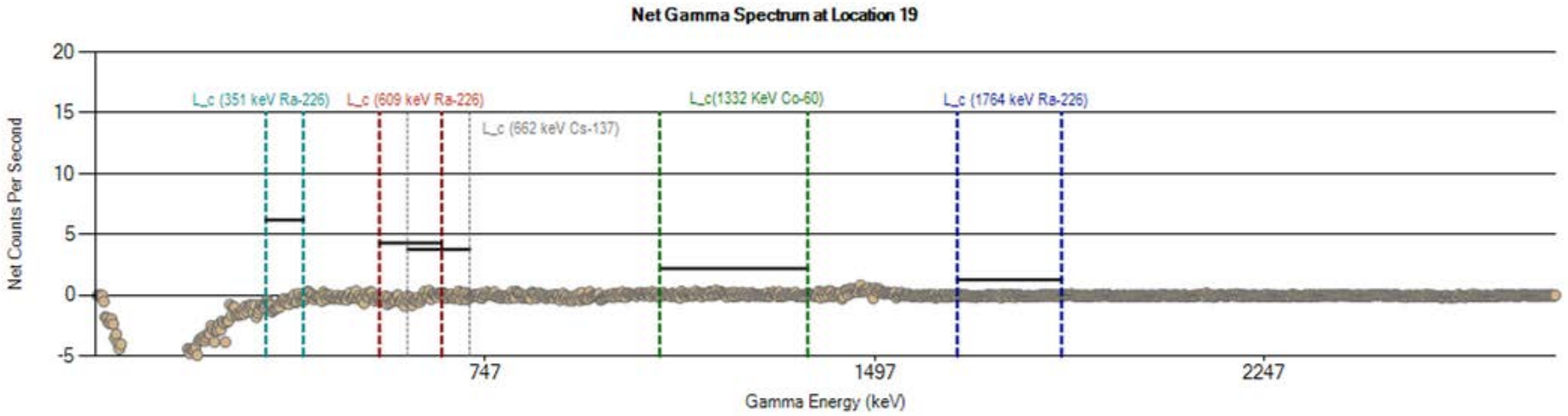


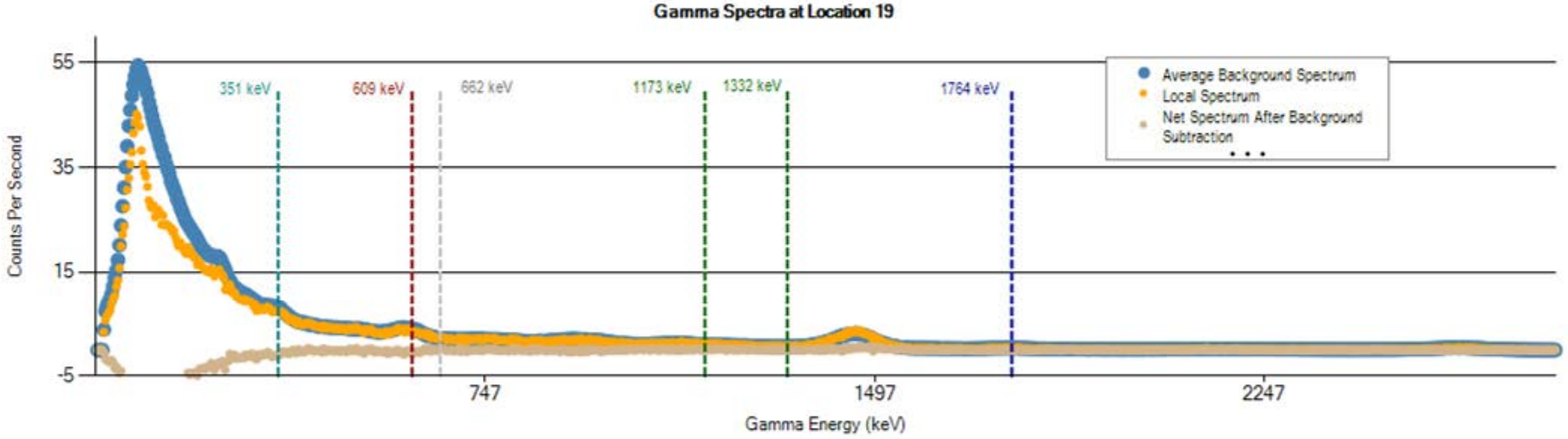
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 17 (cps)	818	117	21	21	142	130	101	158	87	3021
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



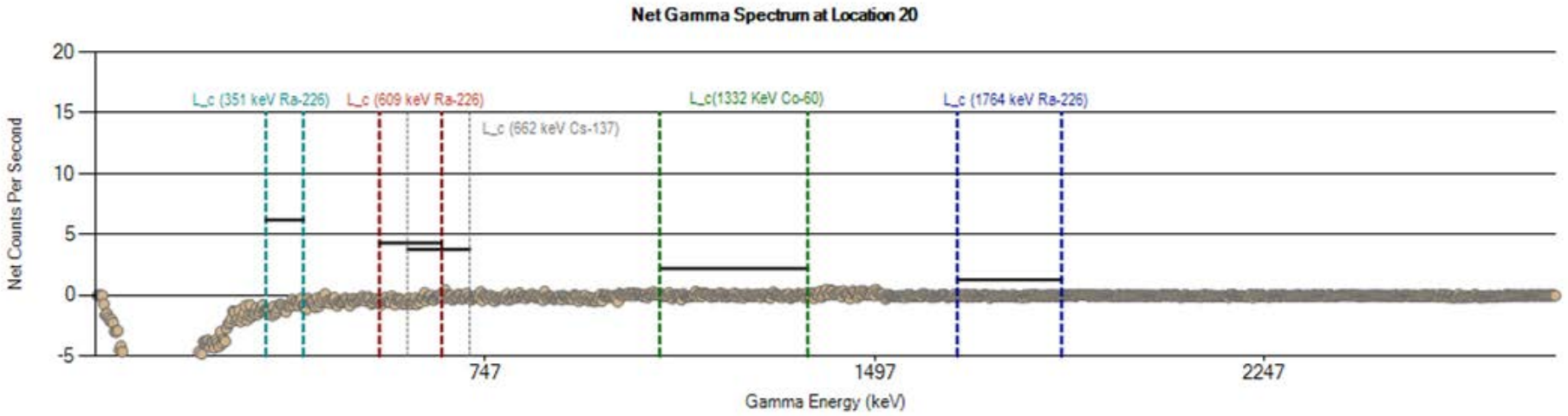


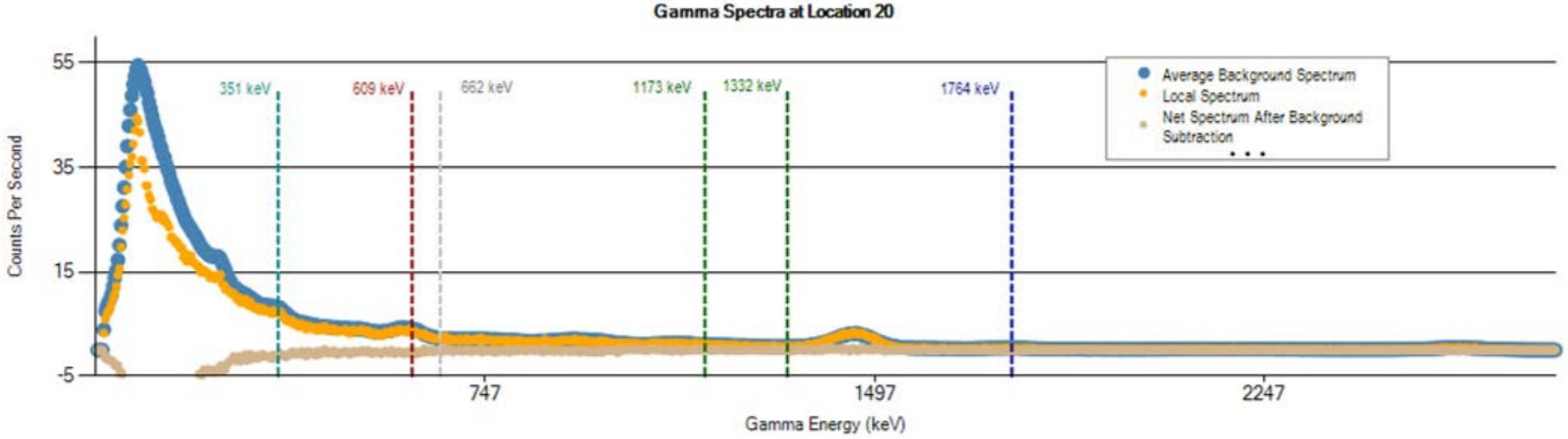
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 18 (cps)	794	115	18	20	137	126	100	153	87	2875
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



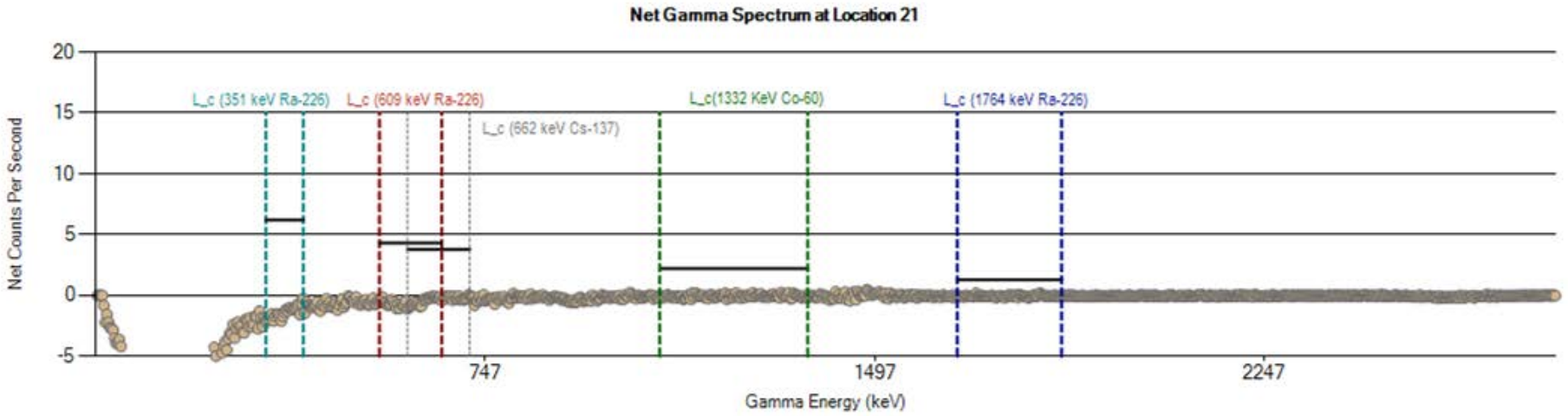


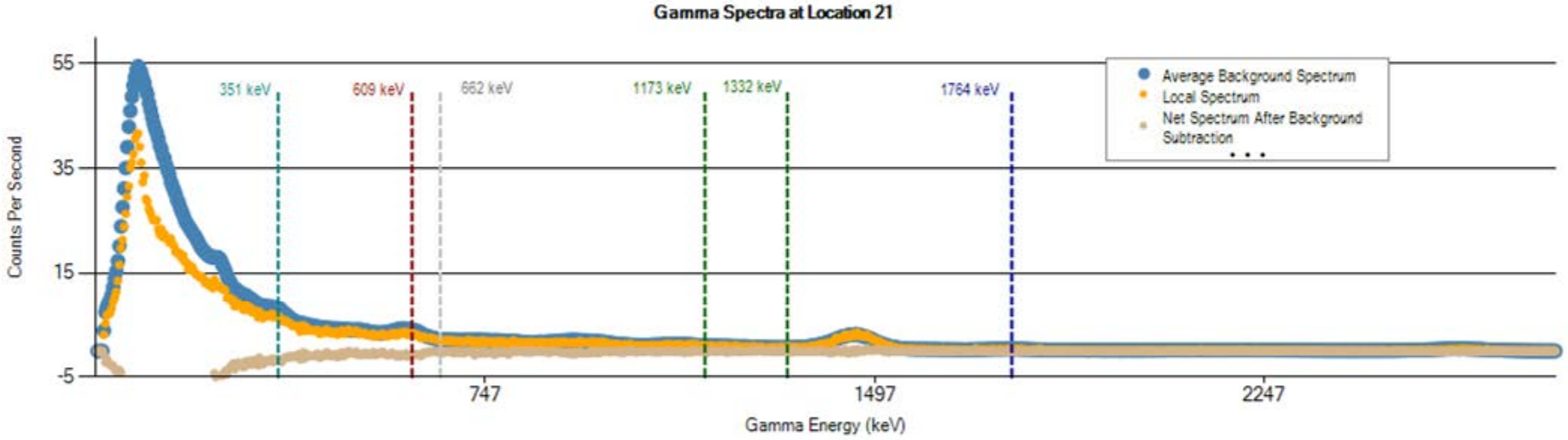
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 19 (cps)	847	128	18	20	144	131	104	161	95	2965
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



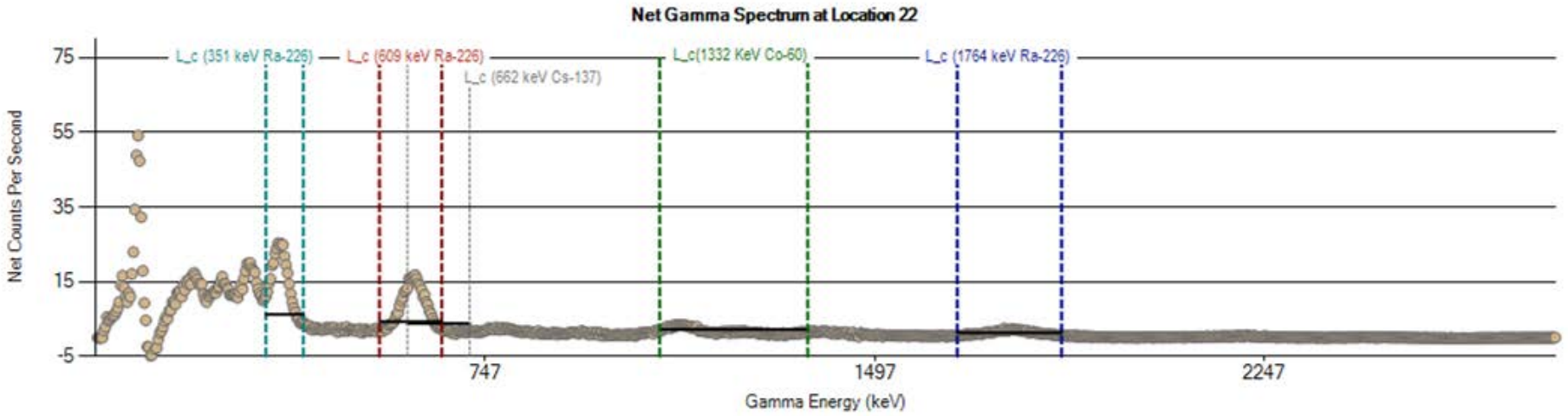


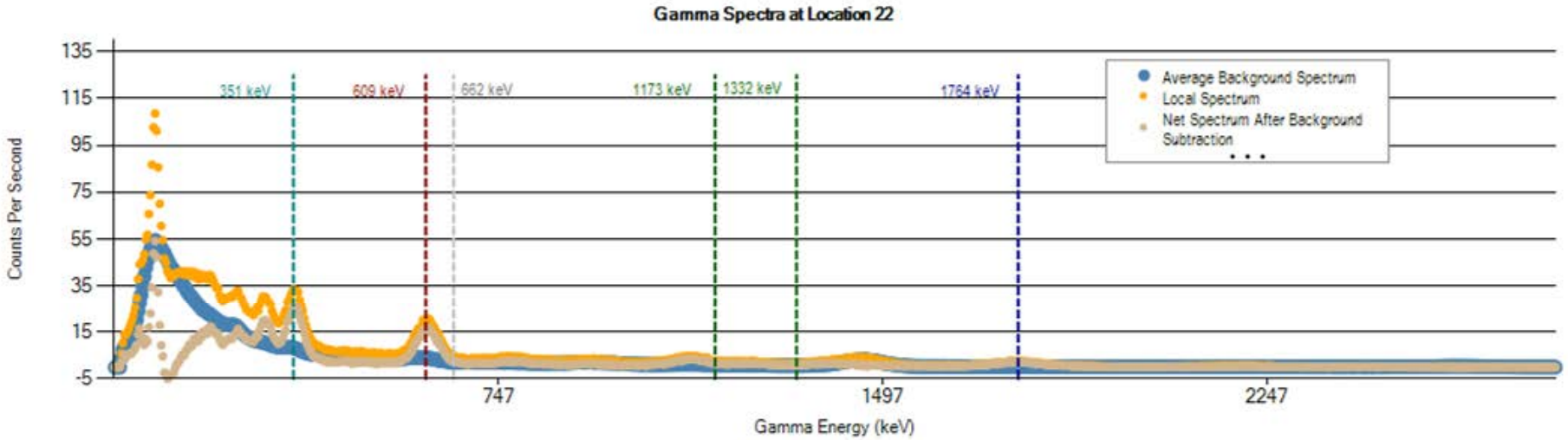
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 20 (cps)	799	120	18	19	135	126	99	151	88	2862
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



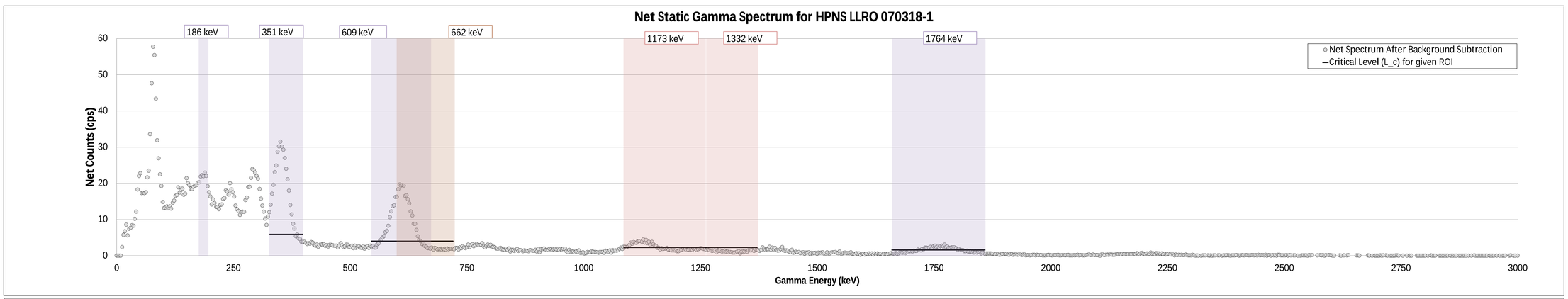


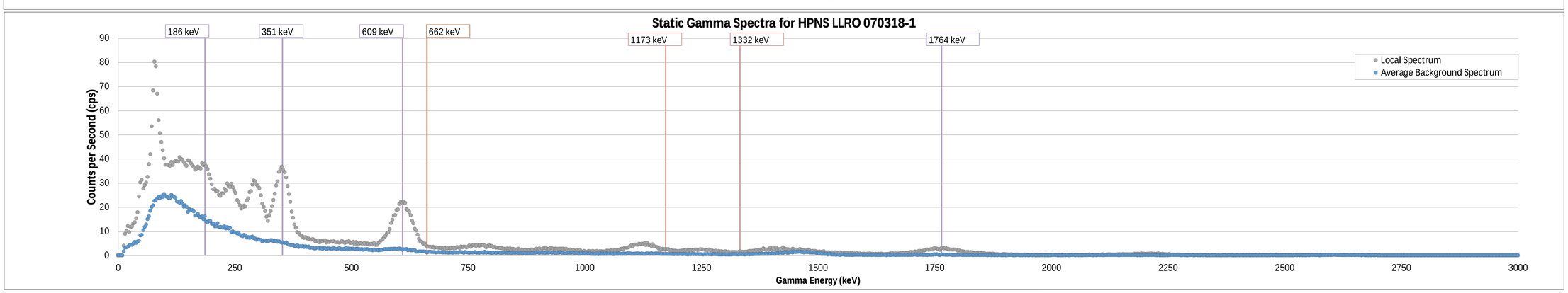
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 21 (cps)	750	114	17	17	130	118	94	140	83	2667
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255





	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 22 (cps)	1846	179	111	23	239	471	356	539	253	6239
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255





Region of Interest (ROI)	ROI 1: Total Counts 411 - 2811 keV	ROI 2: K-40 (K-40 @ 1460.75 keV) 1371 - 1569 keV	ROI 3: Ra-226 (Bi-214 @ 1764.51 keV) 1659 - 1860 keV	ROI 4: Th-232 (Tl-208 @ 2614.00 keV) 2409 - 2811 keV	ROI 5: Annihilation (e^- + e^+ @ 511.00 keV) 456 - 570 keV	ROI 6: Ra-226 (Bi-214 @ 609.32 keV) 546 - 666 keV	ROI 7: Cs-137 (Ba-137m @ 661.62 keV) 600 - 720 keV	ROI 8: Ra-226 (Pb-214 @ 351.99 keV) 327 - 399 keV	ROI 9: Co-60 (Ni-60m @ 1173.23/1332.51 keV) 1086 - 1371 keV	ROI 10: Gross Counts 24 - 2811 keV
Sum of Local Counts in ROI	**1,698**	**134**	**119**	18	**208**	**466**	**355**	**542**	**245**	**5,508**
μ + 3σ Investigation Level (Based on Sum of Bkgd. Counts in ROI)	602	82	28	23	132	121	95	154	80	2,200

Radium-226 Analysis Summary	
Are there critical level exceedances in Ra-226 ROIs?	Yes
For which Ra-226 ROIs do critical level exceedances occur?	ROI 8, ROI 6, ROI 3
Does the sum of the counts in any Ra-226 ROIs exceed the μ + 3σ IL?	Yes
For which Ra-226 ROIs do μ + 3σ IL exceedances occur?	ROI 3, ROI 6, ROI 8
What is the Ra-226 to Th-232 activity ratio?	3.9
Is this ratio outside of the background ratio range (0.5 to 2.5)?	Yes
Is there a visibly identifiable net peak at 186 keV?	Yes
Conclusion: Ra-226.	

Cesium-137 Analysis Summary	
Are there any critical level exceedances in Cs-137 ROIs?	Yes
For which Cs-137 ROIs do critical level exceedances occur?	ROI 7
Does the sum of the counts in any Cs-137 ROIs exceed the μ + 3σ IL?	Yes
For which Cs-137 ROIs do μ + 3σ IL exceedances occur?	ROI 7
Are there visibly identifiable peaks in the spectra for Cs-137?	N/A
Are net peaks aligned with known emission energies?	N/A
Is the activity in Cs-137 ROIs inconsistent with activity at adjacent energies?	N/A
Conclusion: Cs-137 activity consistent with background.	

Elevated activity in Cs-137 ROI due to the presence of Ra-226 daughter (Bi-214) at ~665 keV.

*Critical and investigation levels are based on background activity, and exceedances do not necessarily indicate the presence of Cs-137 above background. Cs-137 exists at very low concentrations in the background, resulting in low critical and investigation levels that are easily exceeded due to compton scattering of higher energy photons. Confirmation of net Cs-137 requires visible identification of a signficant peak at 662 keV (in addition to critical level and investigation level exceedances in ROI 7).

Co-60 Analysis Summary	
Are there any critical level exceedances in Co-60 ROIs?	Yes
For which Co-60 ROIs do critical level exceedances occur?	ROI 9
Does the sum of the counts in any Co-60 ROIs exceed the μ + 3σ IL?	Yes
For which Co-60 ROIs do μ + 3σ IL exceedances occur?	ROI 9
Are there two visibly identifiable peaks in the spectra for Co-60?	N/A
Are both net peaks aligned with known emission energies?	N/A
Is the activity in Co-60 ROIs inconsistent with activity at adjacent energies?	N/A
Conclusion: Co-60 activity consistent with background.	

Elevated activity in Co-60 ROI due to the presence of Ra-226 daughters (Bi-214) at ~1120 and 1238 keV.

*Critical and investigation levels are based on background activity, and exceedances do not necessarily indicate the presence of Co-60 above background. Co-60 does not exist naturally in the background, resulting in low critical and investigation levels that are easily exceeded due to compton scattering of higher energy photons. Confirmation of net Co-60 requires visible identification of signficant peaks at 1173 keV and 1332 keV (in addition to critical level and investigation level exceedances in ROI 9).

NORM Analysis Summary	
Are there any critical level exceedances in Th-232 or K-40 (NORM) ROIs?	Yes
For which isotopes do critical level exceedances occur?	Th-232
Does the sum of the counts in any NORM ROIs exceed the μ + 3σ IL?	Yes
For which isotopes do μ + 3σ IL exceedances occur?	K-40
Is there a visible K-40 line at 1460 keV in the net static spectrum?	No
Which isotopes are responsible for activity in excess of ref. area values?	Th-232, K-40
Elevated activity at NORM energies due to Ra-226 daughters.	
Notes:	

Filename: RSI_Survey_20180716_174838-070318(1).csv

Date of Measurement: 07/16/2018

Background Dataset: RSI2 (SN 7236) HPNS (07/16/2018)

Energy Calibration (keV): 3.00*(channel)

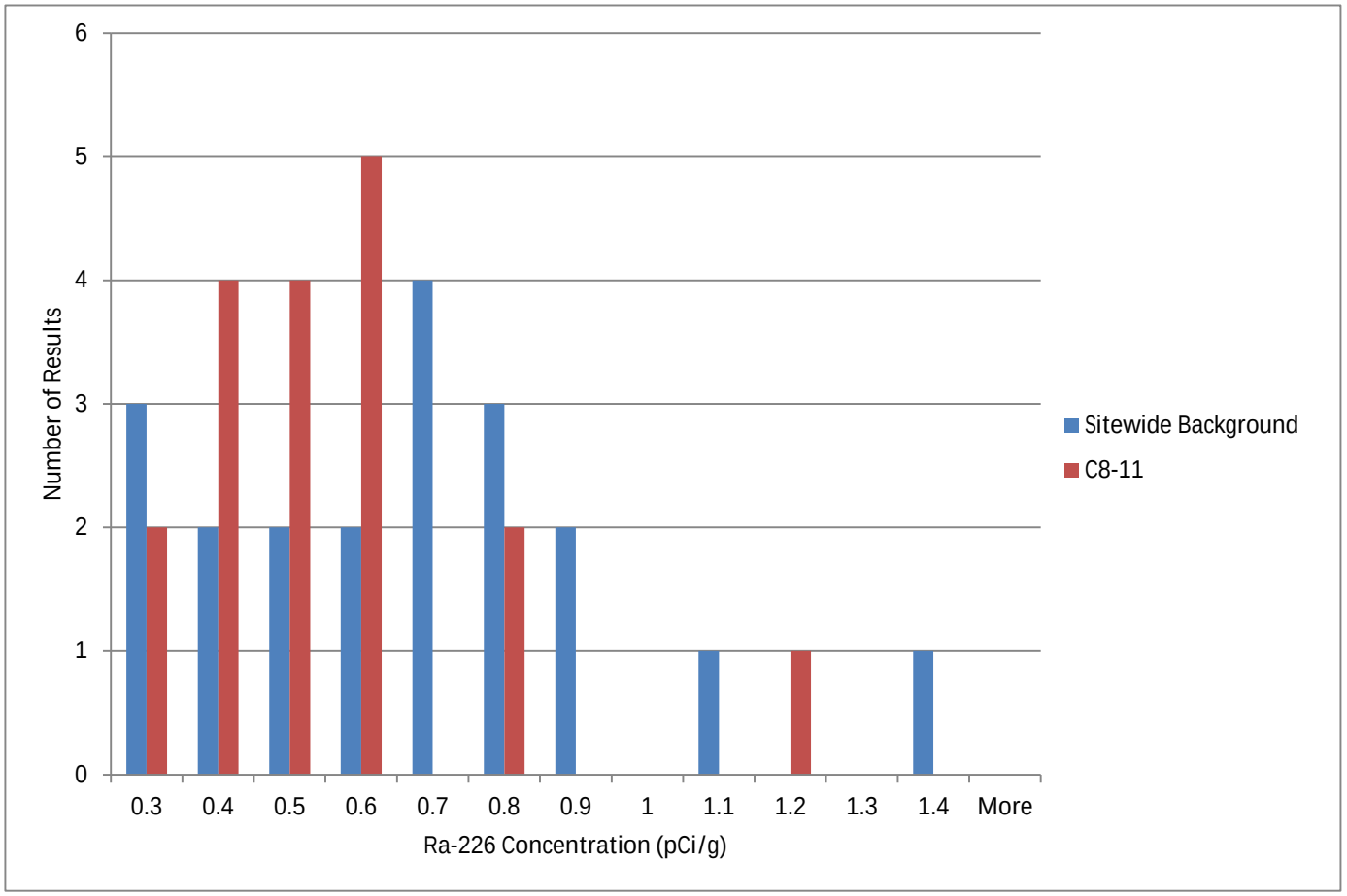
Histogram, RSY C8 (Use 11) vs. Sitewide Background

Background

Bin	*Frequency*
0.3	3
0.4	2
0.5	2
0.6	2
0.7	4
0.8	3
0.9	2
1	0
1.1	1
1.2	0
1.3	0
1.4	1
More	0

C8-11

Bin	*Frequency*
0.3	2
0.4	4
0.5	4
0.6	5
0.7	0
0.8	2
0.9	0
1	0
1.1	0
1.2	1
1.3	0
1.4	0
More	0



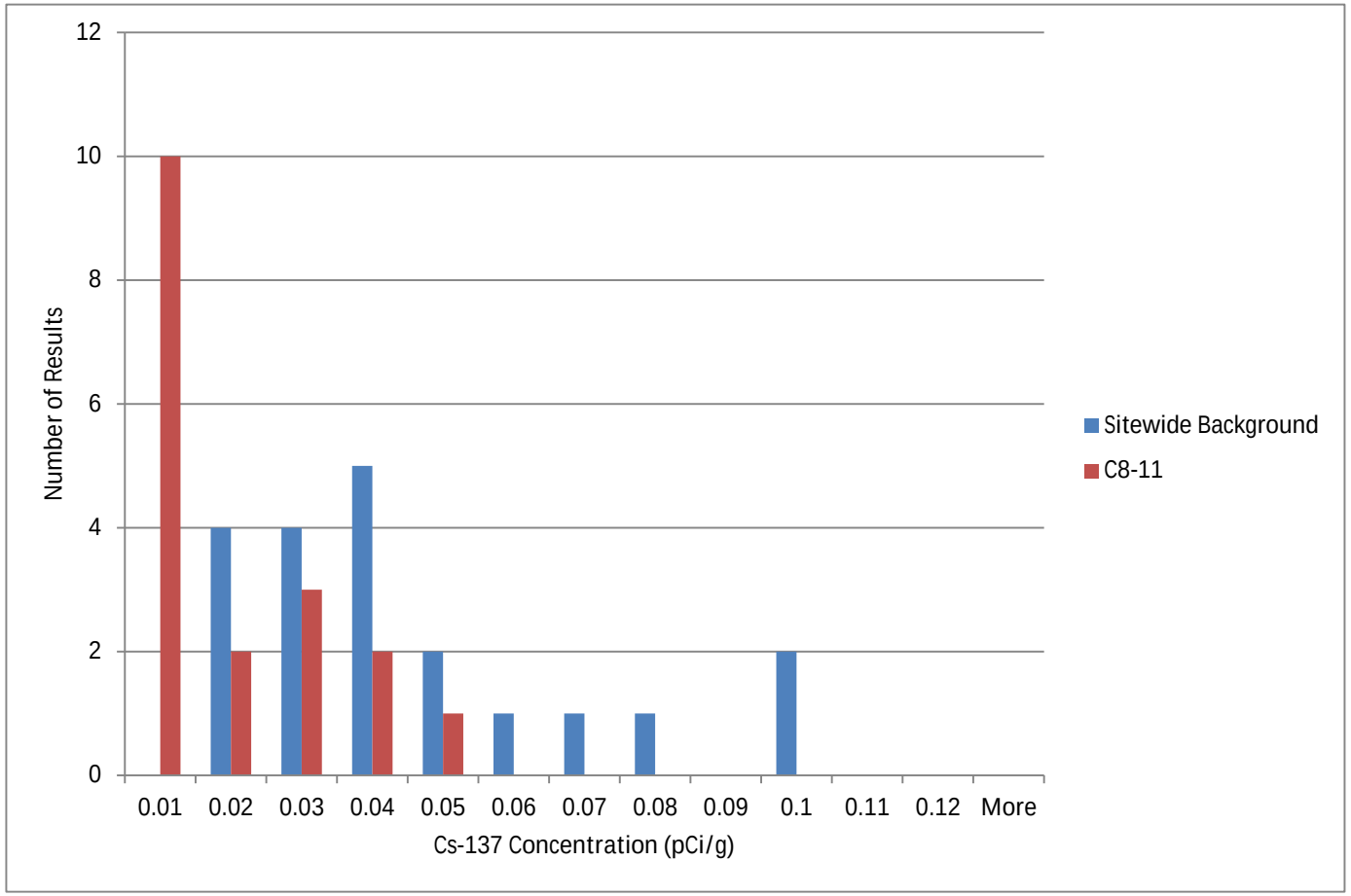
Histogram, RSY C8 (Use 11) vs. Sitewide Background

Background

Bin	*Frequency*
0.01	0
0.02	4
0.03	4
0.04	5
0.05	2
0.06	1
0.07	1
0.08	1
0.09	0
0.1	2
0.11	0
0.12	0
More	0

C8-11

Bin	*Frequency*
0.01	10
0.02	2
0.03	3
0.04	2
0.05	1
0.06	0
0.07	0
0.08	0
0.09	0
0.1	0
0.11	0
0.12	0
More	0



TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-29329-2
Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Eddie Kalombo

Rhonda Ridenhower

Authorized for release by:
8/6/2018 4:24:58 PM

Rhonda Ridenhower, Manager of Project Management
(314)298-8566
rhonda.ridenhower@testamericainc.com

Table of Contents

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-2

Job ID: 160-29329-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: Hunters Point Naval Shipyard - Parcel E2

Report Number: 160-29329-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup
Method 3620C: Florisil Cleanup
Method 3630C: Silica Gel Cleanup
Method 3640A: Gel-Permeation Cleanup
Method 3650B: Acid-Base Partition Cleanup
Method 3660B: Sulfur Cleanup

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-2

Job ID: 160-29329-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT
The samples were received on 07/05/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 19.0 C.

TOTAL BETA STRONTIUM (GFPC)
Sample PE2-RSYC8-U11-S011 (160-29329-5) was analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 07/05/2018, prepared on 07/16/2018 and analyzed on 08/02/2018.

The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: PE2-RSYC8-U11-S011 (160-29329-5) and (160-29329-A-5-A DU). The samples contained rocks of varying sizes.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)
Samples PE2-RSYC8-U11-S002 (160-29329-1), PE2-RSYC8-U11-S005 (160-29329-2), PE2-RSYC8-U11-S006 (160-29329-3), PE2-RSYC8-U11-S010 (160-29329-4), PE2-RSYC8-U11-S011 (160-29329-5), PE2-RSYC8-U11-S015 (160-29329-6), PE2-RSYC8-U11-S016 (160-29329-7) and PE2-RSYC8-U11-S018 (160-29329-8) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 07/05/2018, prepared on 07/10/2018 and 07/11/2018 and analyzed on 07/31/2018 and 08/01/2018.

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline.
PE2-RSYC8-U11-S011 (160-29329-5)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

APTIM

CHAIN OF CUSTODY

Ref. Document # PE2_RSYC8_USE11_FWLeadOverEx#544

Page 1 of 2

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Number: 500506
Project Name: CTO-013 RSYC8 USE 11 Freshwater Wetlands Lead Over-Excavation Systematic
Project Location: HPNS - Parcel E-2
Purchase Order #: 202296
Shipment/Pickup Date: 7.2.18
Waybill Number:
Lab Destination: TestAmerica (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63045
Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Project Manager: *Nels Johnson* (Name & phone #)

Send Report To: *Eddie Kalombo*
Phone/Fax Number: *415-987-0760*
Address: *4005 Port Chicago Hwy*
City: *Concord, CA, 94520*
Sampler's Name(s): JOAQUIN RAMIREZ

Sample ID Number	Sample Description	Collection Information: Date	Time	Method	Matrix	# of containers	Preservative (water) / Preservative (soil) / Container Type	Analyses Requested: Gamma Spec (EPA 191.1 M) - (7 day in-growth preliminary results and full 21 day in growth for full gamma results)	Total Strontium (EPA 905 MOD)		Strontium 90 (EPA 905 MOD)			Dose Rate µR/Hr
							Preservative (water)							
							Preservative (soil)	N/A	N/A		N/A			
~~PE2-RSYC8-U11-S001~~	Parcel E-2 RSYC8 USE 11 Systematic			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~	~~X~~		~~X~~			
PE2-RSYC8-U11-S002	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1120	G	SO	1	16 oz. plastic jar	X						5
~~PE2-RSYC8-U11-S003~~	Parcel E-2 RSYC8 USE 11 Systematic			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~						
~~PE2-RSYC8-U11-S004~~	Parcel E-2 RSYC8 USE 11 Systematic			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~						XJE 6/29/18
PE2-RSYC8-U11-S005	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1123	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYC8-U11-S006	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1210	G	SO	1	16 oz. plastic jar	X						5
~~PE2-RSYC8-U11-S007~~	Parcel E-2 RSYC8 USE 11 Systematic			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~						
~~PE2-RSYC8-U11-S008~~	Parcel E-2 RSYC8 USE 11 Systematic			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~						
~~PE2-RSYC8-U11-S009~~	Parcel E-2 RSYC8 USE 11 Systematic			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~						
PE2-RSYC8-U11-S010	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1213	G	SO	1	16 oz. plastic jar	X						5

160-29329 Chain of Custody

Special Instructions:
7 days ingrown draft and follow with 21 days final.
Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g.

☐ 24-hr
Standard TAT -10-day ☐ 3-day ☐ 10-day

Level Of QC Required: I II III Project Specific:

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
JOAQUIN RAMIREZ	6/29/2018	1100	EDDIE KALOMBO	6.29.18	1100
EDDIE KALOMBO	7.2.18	1600	Nicholas Press	7/5/18	0840

Method Codes C = Composite G = Grab

Matrix Codes
DW = Drinking Water SO = Soil
GW = Ground Water SL = Sludge
WW = Waste Water CP = Chip Samples
A = Air ABS=Asbestos, PO=Pipe Openning

APTIM

CHAIN OF CUSTODY

Ref. Document # PE2_RSYC8_USE11_FWLeadOverEx#544

Page 2 of 2

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: *Nels Johnson*
(Name & phone #)

Send Report To: *Eddie Kalombo*
Phone/Fax Number: *415-987-0760*
Address: *4005 Port Chicago Hwy*
City: *Concord, CA, 94520*
Sampler's Name(s): JOAQUIN RAMIREZ

Project Number: 500506
Project Name: CTO-013 RSYC8 USE 11 Freshwater Wetlands Lead Over-Excavation Systematic
Project Location: HPNS - Parcel E-2
Purchase Order #: 202296
Shipment/Pickup Date: 7.2.18
Waybill Number:
Lab Destination: TestAmerica (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63045
Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Sample ID Number	Sample Description	Collection Information: Date	Time	Method	Matrix	# of containers	Preservative (water) / Preservative (soil) / Container Type	Analyses Requested: Gamma Spec (EPA 191.1 M) – (7 day in-growth preliminary results and full 21 day in growth for full gamma results)	Total Strontium (EPA 905 MOD)		Strontium 90 (EPA 905 MOD)			Dose Rate µR/Hr	
							Preservative (water)								
							Preservative (soil)	N/A	N/A		N/A				
							Container Type								
PE2-RSYC8-U11-S011	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1216	G	SO	1	16 oz. plastic jar	X	X		X			5	
~~PE2-RSYC8-U11-S012~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~							
~~PE2-RSYC8-U11-S013~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~							
~~PE2-RSYC8-U11-S014~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~							
PE2-RSYC8-U11-S015	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1219	G	SO	1	16 oz. plastic jar	X						5	
PE2-RSYC8-U11-S016	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1221	G	SO	1	16 oz. plastic jar	X						5	
~~PE2-RSYC8-U11-S017~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~							
PE2-RSYC8-U11-S018	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1224	G	SO	1	16 oz. plastic jar	X						5	

Special Instructions:
7 days ingrown draft and follow with 21 days final.
Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g.

☐ 24-hr
Standard TAT -10-day ☐ 3-day ☐ 10-day

Level Of QC Required: I II **III** Project Specific:

Relinquished By	Date/Time	Received By	Date/Time
JOAQUIN RAMIREZ	6/29/18 1100	EDDIE KALOMBO	6.29.18 1100
EDDIE KALOMBO	7.2.18 1600	Nicholas Rego	7/5/18 0840

Method Codes C = Composite G = Grab

Matrix Codes
DW = Drinking Water SO = Soil
GW = Ground Water SL = Sludge
WW = Waste Water CP = Chip Samples
A = Air ABS=Asbestos, PO=Pipe Openning

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-29329-2

Login Number: 29329

List Source: TestAmerica St. Louis

List Number: 1

Creator: Press, Nicholas B

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29329-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy

None = None

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-29329-1	PE2-RSYC8-U11-S002	Solid	06/29/18 11:20	07/05/18 08:40
160-29329-2	PE2-RSYC8-U11-S005	Solid	06/29/18 11:23	07/05/18 08:40
160-29329-3	PE2-RSYC8-U11-S006	Solid	06/29/18 12:10	07/05/18 08:40
160-29329-4	PE2-RSYC8-U11-S010	Solid	06/29/18 12:13	07/05/18 08:40
160-29329-5	PE2-RSYC8-U11-S011	Solid	06/29/18 12:16	07/05/18 08:40
160-29329-6	PE2-RSYC8-U11-S015	Solid	06/29/18 12:19	07/05/18 08:40
160-29329-7	PE2-RSYC8-U11-S016	Solid	06/29/18 12:21	07/05/18 08:40
160-29329-8	PE2-RSYC8-U11-S018	Solid	06/29/18 12:24	07/05/18 08:40

Client Sample Results

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29329-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Client Sample ID: PE2-RSYC8-U11-S002
Lab Sample ID: 160-29329-1
Date Collected: 06/29/18 11:20
Matrix: Solid
Date Received: 07/05/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.826**		0.338	0.348		0.127	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Actinium-227	0.171	U	1.04	1.04		0.851	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Bismuth-212	-0.831	U	1.40	1.40		1.09	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Bismuth-214	0.210	U	0.157	0.158		0.277	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Cesium-137	**0.142**		0.0621	0.0637	0.0700	0.0197	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Cobalt-60	0.0222	U	0.0782	0.0783	0.200	0.0369	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Lead-210	**1.59**		2.05	2.06		1.33	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Lead-212	**0.634**		0.135	0.150		0.0718	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Lead-214	**0.690**		0.153	0.168		0.0626	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Potassium-40	**9.94**		1.73	2.00		0.446	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Protactinium-231	0.819	U	2.79	2.79		2.90	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Radium-226	0.210	U	0.157	0.158	0.700	0.277	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Radium-228	**0.826**		0.338	0.348		0.127	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Thallium-208	**0.282**		0.0851	0.0898		0.0267	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Thorium-228	**0.634**		0.135	0.150		0.0718	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Thorium-232	**0.826**		0.338	0.348		0.127	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Thorium-234	0.0362	U	1.49	1.49		1.22	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Uranium-235	0.110	U	0.257	0.257		0.686	pCi/g	07/10/18 23:09	07/31/18 19:24	1
Uranium-238	0.0362	U	1.49	1.49		1.22	pCi/g	07/10/18 23:09	07/31/18 19:24	1

Client Sample ID: PE2-RSYC8-U11-S005
Lab Sample ID: 160-29329-2
Date Collected: 06/29/18 11:23
Matrix: Solid
Date Received: 07/05/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.851**		0.268	0.282		0.0478	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Actinium-227	0.0552	U	0.618	0.618		0.424	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Bismuth-212	0.000	U	0.452	0.452		1.04	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Bismuth-214	**0.483**		0.148	0.157		0.0539	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Cesium-137	0.00883	U	0.0781	0.0781	0.0700	0.0628	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Cobalt-60	-0.0320	U	0.0458	0.0460	0.200	0.0631	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Lead-210	**1.43**		1.33	1.34		0.854	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Lead-212	**0.446**		0.108	0.122		0.0490	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Lead-214	**0.618**		0.142	0.156		0.0557	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Potassium-40	**9.63**		1.79	2.04		0.193	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Protactinium-231	0.000	U	0.330	0.330		2.64	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Radium-226	**0.483**		0.148	0.157	0.700	0.0539	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Radium-228	**0.851**		0.268	0.282		0.0478	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Thallium-208	**0.192**		0.0697	0.0725		0.0206	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Thorium-228	**0.446**		0.108	0.122		0.0490	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Thorium-232	**0.851**		0.268	0.282		0.0478	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Thorium-234	**0.908**		1.17	1.17		0.901	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Uranium-235	0.140	U	0.296	0.297		0.259	pCi/g	07/10/18 23:09	07/31/18 19:26	1
Uranium-238	**0.908**		1.17	1.17		0.901	pCi/g	07/10/18 23:09	07/31/18 19:26	1

Client Sample Results

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29329-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Client Sample ID: PE2-RSYC8-U11-S006
Lab Sample ID: 160-29329-3
Date Collected: 06/29/18 12:10
Matrix: Solid
Date Received: 07/05/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.614**		0.141	0.154		0.0575	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Actinium-227	-0.387	U	1.03	1.03		0.836	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Bismuth-212	0.0147	U	0.916	0.916		0.753	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Bismuth-214	**0.486**		0.143	0.151		0.0631	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Cesium-137	0.0289	U	0.0611	0.0612	0.0700	0.0474	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Cobalt-60	**0.0343**		0.0424	0.0425	0.200	0.0289	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Lead-210	**1.32**		1.49	1.50		1.02	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Lead-212	**0.465**		0.101	0.112		0.0514	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Lead-214	**0.538**		0.153	0.163		0.0707	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Potassium-40	**9.81**		1.55	1.84		0.273	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Protactinium-231	-0.219	U	3.04	3.04		2.50	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Radium-226	**0.486**		0.143	0.151	0.700	0.0631	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Radium-228	**0.614**		0.141	0.154		0.0575	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Thallium-208	**0.186**		0.0625	0.0653		0.0202	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Thorium-228	**0.465**		0.101	0.112		0.0514	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Thorium-232	**0.614**		0.141	0.154		0.0575	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Thorium-234	0.204	U	0.218	0.219		1.11	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Uranium-235	0.107	U	0.492	0.492		0.401	pCi/g	07/11/18 01:32	08/01/18 14:44	1
Uranium-238	0.204	U	0.218	0.219		1.11	pCi/g	07/11/18 01:32	08/01/18 14:44	1

Client Sample ID: PE2-RSYC8-U11-S010
Lab Sample ID: 160-29329-4
Date Collected: 06/29/18 12:13
Matrix: Solid
Date Received: 07/05/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.658**		0.164	0.178		0.0335	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Actinium-227	0.220	U	0.345	0.346		0.351	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Bismuth-212	0.207	U	0.510	0.511		0.388	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Bismuth-214	**0.366**		0.122	0.128		0.0509	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Cesium-137	**0.125**		0.0530	0.0545	0.0700	0.0250	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Cobalt-60	0.0250	U	0.0561	0.0561	0.200	0.0313	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Lead-210	-0.656	U	1.30	1.30		0.958	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Lead-212	**0.389**		0.0990	0.111		0.0556	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Lead-214	**0.485**		0.105	0.117		0.0436	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Potassium-40	**12.8**		1.74	2.18		0.254	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Protactinium-231	0.000	U	0.638	0.638		1.97	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Radium-226	**0.366**		0.122	0.128	0.700	0.0509	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Radium-228	**0.658**		0.164	0.178		0.0335	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Thallium-208	**0.122**		0.0485	0.0501		0.0189	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Thorium-228	**0.389**		0.0990	0.111		0.0556	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Thorium-232	**0.658**		0.164	0.178		0.0335	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Thorium-234	**1.03**		1.21	1.21		0.942	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Uranium-235	-0.0196	U	0.0309	0.0310		0.265	pCi/g	07/11/18 01:32	08/01/18 14:41	1
Uranium-238	**1.03**		1.21	1.21		0.942	pCi/g	07/11/18 01:32	08/01/18 14:41	1

Client Sample Results

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29329-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Client Sample ID: PE2-RSYC8-U11-S011
Lab Sample ID: 160-29329-5
Date Collected: 06/29/18 12:16
Matrix: Solid
Date Received: 07/05/18 08:40

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	**0.0706**		0.0633	0.0635	0.331	0.0461	pCi/g	07/16/18 13:23	08/02/18 05:37	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*91.3*		*40 - 110*	*07/16/18 13:23*	*08/02/18 05:37*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.557**		0.261	0.267		0.225	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Actinium-227	0.289	U	0.541	0.542		0.748	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Bismuth-212	0.336	U	1.13	1.13		0.902	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Bismuth-214	**0.490**		0.195	0.201		0.0878	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Cesium-137	0.00345	U	0.106	0.106	0.0700	0.0870	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Cobalt-60	-0.00185	U	0.00714	0.00714	0.200	0.0606	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Lead-210	**1.35**		1.85	1.85		1.17	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Lead-212	**0.577**		0.123	0.137		0.0637	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Lead-214	**0.668**		0.142	0.157		0.0702	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Potassium-40	**12.2**		1.84	2.22		0.422	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Protactinium-231	0.278	U	1.79	1.79		2.78	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Radium-226	**0.490**		0.195	0.201	0.700	0.0878	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Radium-228	**0.557**		0.261	0.267		0.225	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Thallium-208	**0.269**		0.0937	0.0976		0.0337	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Thorium-228	**0.577**		0.123	0.137		0.0637	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Thorium-232	**0.557**		0.261	0.267		0.225	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Thorium-234	0.637	U	1.07	1.08		0.838	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Uranium-235	-0.0719	U	0.408	0.408		0.583	pCi/g	07/11/18 02:14	08/01/18 09:05	1
Uranium-238	0.637	U	1.07	1.08		0.838	pCi/g	07/11/18 02:14	08/01/18 09:05	1

Client Sample ID: PE2-RSYC8-U11-S015
Lab Sample ID: 160-29329-6
Date Collected: 06/29/18 12:19
Matrix: Solid
Date Received: 07/05/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**1.06**		0.265	0.287		0.0386	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Actinium-227	0.0899	U	0.960	0.960		0.787	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Bismuth-212	0.348	U	0.856	0.856		0.668	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Bismuth-214	**0.756**		0.159	0.177		0.0410	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Cesium-137	0.0125	U	0.0708	0.0708	0.0700	0.0566	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Cobalt-60	-0.0602	U	0.0837	0.0839	0.200	0.0761	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Lead-210	-0.273	U	1.25	1.25		1.61	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Lead-212	**0.786**		0.129	0.165		0.0572	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Lead-214	**0.707**		0.148	0.165		0.0732	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Potassium-40	**13.4**		1.93	2.37		0.290	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Protactinium-231	0.916	U	2.56	2.56		2.80	pCi/g	07/11/18 02:14	08/01/18 09:06	1

Client Sample Results

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29329-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Client Sample ID: PE2-RSYC8-U11-S015
Lab Sample ID: 160-29329-6
Date Collected: 06/29/18 12:19
Matrix: Solid
Date Received: 07/05/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.756**		0.159	0.177	0.700	0.0410	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Radium-228	**1.06**		0.265	0.287		0.0386	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Thallium-208	**0.289**		0.0706	0.0767		0.0167	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Thorium-228	**0.786**		0.129	0.165		0.0572	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Thorium-232	**1.06**		0.265	0.287		0.0386	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Thorium-234	-0.318	U	1.79	1.79		1.49	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Uranium-235	-0.0760	U	0.118	0.119		0.533	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Uranium-238	-0.318	U	1.79	1.79		1.49	pCi/g	07/11/18 02:14	08/01/18 09:06	1

Client Sample ID: PE2-RSYC8-U11-S016
Lab Sample ID: 160-29329-7
Date Collected: 06/29/18 12:21
Matrix: Solid
Date Received: 07/05/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.577**		0.306	0.311		0.130	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Actinium-227	-0.355	U	1.04	1.04		0.840	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Bismuth-212	-0.0157	U	1.03	1.03		0.844	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Bismuth-214	**0.588**		0.150	0.162		0.0580	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Cesium-137	-0.0110	U	0.0956	0.0956	0.0700	0.0540	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Cobalt-60	-0.00740	U	0.0885	0.0885	0.200	0.0435	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Lead-210	**2.13**		1.95	1.97		1.21	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Lead-212	**0.588**		0.117	0.132		0.0596	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Lead-214	**0.477**		0.123	0.132		0.0622	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Potassium-40	**12.5**		1.67	2.10		0.130	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Protactinium-231	0.000	U	0.256	0.256		2.64	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Radium-226	**0.588**		0.150	0.162	0.700	0.0580	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Radium-228	**0.577**		0.306	0.311		0.130	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Thallium-208	**0.277**		0.0723	0.0776		0.0177	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Thorium-228	**0.588**		0.117	0.132		0.0596	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Thorium-232	**0.577**		0.306	0.311		0.130	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Thorium-234	0.00593	U	0.0115	0.0115		1.47	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Uranium-235	-0.00589	U	0.00777	0.00779		0.525	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Uranium-238	0.00593	U	0.0115	0.0115		1.47	pCi/g	07/11/18 00:47	08/01/18 22:05	1

Client Sample ID: PE2-RSYC8-U11-S018
Lab Sample ID: 160-29329-8
Date Collected: 06/29/18 12:24
Matrix: Solid
Date Received: 07/05/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.347**		0.181	0.185		0.134	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Actinium-227	0.136	U	0.534	0.534		0.363	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Bismuth-212	**1.22**		0.463	0.480		0.0992	pCi/g	07/11/18 00:47	08/01/18 22:05	1

Client Sample Results

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29329-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Client Sample ID: PE2-RSYC8-U11-S018
Lab Sample ID: 160-29329-8
Date Collected: 06/29/18 12:24
Matrix: Solid
Date Received: 07/05/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Bismuth-214	**0.439**		0.120	0.129		0.0456	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Cesium-137	0.0283	U	0.0618	0.0619	0.0700	0.0482	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Cobalt-60	**0.0358**		0.0284	0.0287	0.200	0.0123	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Lead-210	0.793	U	1.25	1.25		0.852	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Lead-212	**0.251**		0.0739	0.0807		0.0396	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Lead-214	**0.441**		0.113	0.122		0.0424	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Potassium-40	**9.14**		1.43	1.71		0.235	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Protactinium-231	-0.829	U	2.66	2.66		2.17	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Radium-226	**0.439**		0.120	0.129	0.700	0.0456	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Radium-228	**0.347**		0.181	0.185		0.134	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Thallium-208	**0.139**		0.0527	0.0547		0.0215	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Thorium-228	**0.251**		0.0739	0.0807		0.0396	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Thorium-232	**0.347**		0.181	0.185		0.134	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Thorium-234	0.481	U	0.830	0.832		0.568	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Uranium-235	0.169	U	0.251	0.251		0.243	pCi/g	07/11/18 00:47	08/01/18 22:05	1
Uranium-238	0.481	U	0.830	0.832		0.568	pCi/g	07/11/18 00:47	08/01/18 22:05	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-2

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-375997/22-A
Matrix: Solid
Analysis Batch: 380120

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 375997

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.02741	U	0.0701	0.0701	0.331	0.0556	pCi/g	07/16/18 13:23	08/03/18 05:52	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*90.1*		*40 - 110*	*07/16/18 13:23*	*08/03/18 05:52*	*1*

Lab Sample ID: LCS 160-375997/1-A
Matrix: Solid
Analysis Batch: 379945

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 375997

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2 +/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits		
Total Beta Strontium			8.21	8.560		0.685	0.331	0.0493	pCi/g	104	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*88.9*		*40 - 110*

Lab Sample ID: 160-29329-5 DU
Matrix: Solid
Analysis Batch: 379945

Client Sample ID: PE2-RSYC8-U11-S011
Prep Type: Total/NA
Prep Batch: 375997

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2 +/-)	LOQ	DLC	Unit			RER	RER Limit
Total Beta Strontium	0.0706			0.07148		0.0640	0.331	0.0466	pCi/g			0.01	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Sr Carrier	*92.7*		*40 - 110*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-374816/1-A
Matrix: Solid
Analysis Batch: 379160

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 374816

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	-0.08762	U	0.309	0.309		0.158	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Actinium-227	0.06605	U	0.138	0.139		0.671	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Bismuth-212	-0.6029	U	1.02	1.02		0.785	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Bismuth-214	-0.07550	U	0.155	0.155		0.179	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Cesium-137	-0.03385	U	0.0752	0.0753	0.0700	0.0583	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Cobalt-60	0.0000	U	0.0191	0.0191	0.200	0.0157	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Lead-210	0.5456	U	1.81	1.81		1.19	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Lead-214	-0.02347	U	0.109	0.109		0.0913	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Protactinium-231	0.0000	U	0.311	0.311		2.06	pCi/g	07/10/18 23:09	07/31/18 16:05	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: MB 160-374816/1-A
Matrix: Solid
Analysis Batch: 379160

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 374816

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.07550	U	0.155	0.155	0.700	0.179	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Radium-228	-0.08762	U	0.309	0.309		0.158	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Thallium-208	0.03909	U	0.0752	0.0754		0.0472	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Thorium-232	-0.08762	U	0.309	0.309		0.158	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Thorium-234	0.5693	U	0.924	0.926		0.622	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Uranium-235	-0.2611	U	0.374	0.375		0.574	pCi/g	07/10/18 23:09	07/31/18 16:05	1
Uranium-238	0.5693	U	0.924	0.926		0.622	pCi/g	07/10/18 23:09	07/31/18 16:05	1

Lab Sample ID: MB 160-374816/1-A
Matrix: Solid
Analysis Batch: 379161

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 374816

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Lead-212	0.02924	U	0.0625	0.0626		0.0489	pCi/g	07/10/18 23:09	07/31/18 22:19	1
Potassium-40	0.1303	U	0.418	0.419		0.314	pCi/g	07/10/18 23:09	07/31/18 22:19	1
Thorium-228	0.02924	U	0.0625	0.0626		0.0489	pCi/g	07/10/18 23:09	07/31/18 22:19	1

Lab Sample ID: LCS 160-374816/2-A
Matrix: Solid
Analysis Batch: 379163

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 374816

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2 +/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	96.10		10.1		0.566	pCi/g	99	87 - 116
Cesium-137	28.2	28.22		3.02	0.0700	0.0997	pCi/g	100	87 - 120
Cobalt-60	12.9	12.44		1.31	0.200	0.0475	pCi/g	96	87 - 115

Lab Sample ID: MB 160-374819/1-A
Matrix: Solid
Analysis Batch: 379553

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 374819

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	-0.1464	U	0.169	0.170		0.169	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Actinium-227	-0.1094	U	0.667	0.667		0.455	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Bismuth-212	-0.4062	U	1.18	1.18		0.939	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Bismuth-214	0.09693	U	0.0921	0.0927		0.134	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Cesium-137	-0.007141	U	0.0958	0.0958	0.0700	0.0495	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Cobalt-60	0.0000	U	0.0122	0.0122	0.200	0.0142	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Lead-210	-1.048	U	1.38	1.39		1.07	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Lead-212	-0.01340	U	0.0856	0.0856		0.0710	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Lead-214	-0.005758	U	0.0769	0.0769		0.0629	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Potassium-40	0.1252	U	0.526	0.526		0.402	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Protactinium-231	0.0000002695	U	2.60	2.60		2.14	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Radium-226	0.09693	U	0.0921	0.0927	0.700	0.134	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Radium-228	-0.1464	U	0.169	0.170		0.169	pCi/g	07/11/18 00:47	08/01/18 20:30	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: MB 160-374819/1-A
Matrix: Solid
Analysis Batch: 379553

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 374819

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Thallium-208	-0.0009897	U	0.00210	0.00211		0.0333	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Thorium-228	-0.01340	U	0.0856	0.0856		0.0710	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Thorium-232	-0.1464	U	0.169	0.170		0.169	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Thorium-234	0.5678	U	1.08	1.08		0.717	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Uranium-235	-0.1133	U	0.266	0.267		0.311	pCi/g	07/11/18 00:47	08/01/18 20:30	1
Uranium-238	0.5678	U	1.08	1.08		0.717	pCi/g	07/11/18 00:47	08/01/18 20:30	1

Lab Sample ID: LCS 160-374819/2-A
Matrix: Solid
Analysis Batch: 379548

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 374819

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2 +/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	98.28		11.6		0.690	pCi/g	102	87 - 116
Cesium-137	28.2	31.74		3.35	0.0700	0.152	pCi/g	112	87 - 120
Cobalt-60	12.9	14.18		1.49	0.200	0.0980	pCi/g	110	87 - 115

Lab Sample ID: MB 160-374820/1-A
Matrix: Solid
Analysis Batch: 379548

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 374820

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.02061	U	0.207	0.207		0.107	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Actinium-227	0.1004	U	0.452	0.452		0.682	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Bismuth-212	-0.01117	U	0.690	0.690		0.567	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Bismuth-214	-0.05989	U	0.307	0.307		0.255	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Cesium-137	0.0000	U	0.0221	0.0221	0.0700	0.0428	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Cobalt-60	0.04309		0.0385	0.0388	0.200	0.0186	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Lead-210	-1.693	U	1.87	1.88		1.63	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Lead-212	-0.1072	U	0.104	0.105		0.118	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Lead-214	-0.1018	U	0.193	0.193		0.152	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Potassium-40	-0.008049	U	0.661	0.661		0.534	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Protactinium-231	0.08910	U	2.79	2.79		2.29	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Radium-226	-0.05989	U	0.307	0.307	0.700	0.255	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Radium-228	0.02061	U	0.207	0.207		0.107	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Thallium-208	0.02707	U	0.0654	0.0654		0.0348	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Thorium-228	-0.1072	U	0.104	0.105		0.118	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Thorium-232	0.02061	U	0.207	0.207		0.107	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Thorium-234	-0.8040	U	1.52	1.53		1.29	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Uranium-235	0.1080	U	0.650	0.650		0.530	pCi/g	07/11/18 01:32	08/01/18 12:53	1
Uranium-238	-0.8040	U	1.52	1.53		1.29	pCi/g	07/11/18 01:32	08/01/18 12:53	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-374820/2-A
Matrix: Solid
Analysis Batch: 379551

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 374820

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2 +/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	97.27		10.2		0.648	pCi/g	100	87 - 116
Cesium-137	28.2	28.63		3.09	0.0700	0.137	pCi/g	101	87 - 120
Cobalt-60	12.9	12.76		1.36	0.200	0.0186	pCi/g	99	87 - 115

Lab Sample ID: MB 160-374823/1-A
Matrix: Solid
Analysis Batch: 379554

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 374823

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.01879	U	0.0461	0.0461		0.125	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Actinium-227	0.1501	U	0.298	0.299		0.284	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Bismuth-212	0.2520	U	0.723	0.723		0.561	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Bismuth-214	-0.01018	U	0.0142	0.0142		0.125	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Cesium-137	0.0000	U	0.00922	0.00922	0.0700	0.0232	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Cobalt-60	-0.001443	U	0.0812	0.0812	0.200	0.0162	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Lead-210	0.03866	U	1.24	1.24		0.896	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Lead-212	-0.002459	U	0.0791	0.0791		0.0650	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Lead-214	0.00007360	U	0.106	0.106		0.0868	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Potassium-40	-0.2980	U	0.910	0.910		0.498	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Protactinium-231	0.0000	U	0.294	0.294		1.91	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Radium-226	-0.01018	U	0.0142	0.0142	0.700	0.125	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Radium-228	0.01879	U	0.0461	0.0461		0.125	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Thallium-208	0.04770		0.0620	0.0622		0.0266	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Thorium-228	-0.002459	U	0.0791	0.0791		0.0650	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Thorium-232	0.01879	U	0.0461	0.0461		0.125	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Thorium-234	-0.2907	U	0.996	0.997		0.833	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Uranium-235	0.05080	U	0.263	0.263		0.212	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Uranium-238	-0.2907	U	0.996	0.997		0.833	pCi/g	07/11/18 02:14	08/01/18 07:40	1

Lab Sample ID: LCS 160-374823/2-A
Matrix: Solid
Analysis Batch: 379556

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 374823

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2 +/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	92.69		9.76		0.593	pCi/g	96	87 - 116
Cesium-137	28.2	27.42		2.95	0.0700	0.122	pCi/g	97	87 - 120
Cobalt-60	12.9	12.33		1.31	0.200	0.0562	pCi/g	95	87 - 115

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-2

Rad

Leach Batch: 374210

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29329-1	PE2-RSYC8-U11-S002	Total/NA	Solid	Dry and Grind	
160-29329-2	PE2-RSYC8-U11-S005	Total/NA	Solid	Dry and Grind	
160-29329-3	PE2-RSYC8-U11-S006	Total/NA	Solid	Dry and Grind	
160-29329-4	PE2-RSYC8-U11-S010	Total/NA	Solid	Dry and Grind	
160-29329-5	PE2-RSYC8-U11-S011	Total/NA	Solid	Dry and Grind	
160-29329-6	PE2-RSYC8-U11-S015	Total/NA	Solid	Dry and Grind	
160-29329-7	PE2-RSYC8-U11-S016	Total/NA	Solid	Dry and Grind	
160-29329-8	PE2-RSYC8-U11-S018	Total/NA	Solid	Dry and Grind	
160-29329-5 DU	PE2-RSYC8-U11-S011	Total/NA	Solid	Dry and Grind	

Prep Batch: 374816

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29329-1	PE2-RSYC8-U11-S002	Total/NA	Solid	Fill_Geo-21	374210
160-29329-2	PE2-RSYC8-U11-S005	Total/NA	Solid	Fill_Geo-21	374210
MB 160-374816/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-374816/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 374819

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29329-7	PE2-RSYC8-U11-S016	Total/NA	Solid	Fill_Geo-21	374210
160-29329-8	PE2-RSYC8-U11-S018	Total/NA	Solid	Fill_Geo-21	374210
MB 160-374819/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-374819/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 374820

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29329-3	PE2-RSYC8-U11-S006	Total/NA	Solid	Fill_Geo-21	374210
160-29329-4	PE2-RSYC8-U11-S010	Total/NA	Solid	Fill_Geo-21	374210
MB 160-374820/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-374820/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 374823

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29329-5	PE2-RSYC8-U11-S011	Total/NA	Solid	Fill_Geo-21	374210
160-29329-6	PE2-RSYC8-U11-S015	Total/NA	Solid	Fill_Geo-21	374210
MB 160-374823/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-374823/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 375997

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29329-5	PE2-RSYC8-U11-S011	Total/NA	Solid	DPS-0	374210
MB 160-375997/22-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-375997/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	
160-29329-5 DU	PE2-RSYC8-U11-S011	Total/NA	Solid	DPS-0	374210

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-2

Method: 905.0 - Total Beta Strontium (GFPC)

Matrix: Solid

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)							
Lab Sample ID	Client Sample ID	Sr Carrier (40-110)							
160-29329-5	PE2-RSYC8-U11-S011	91.3							
160-29329-5 DU	PE2-RSYC8-U11-S011	92.7							
LCS 160-375997/1-A	Lab Control Sample	88.9							
MB 160-375997/22-A	Method Blank	90.1							

Tracer/Carrier Legend

Sr Carrier = Sr Carrier

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-29906-2
Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Eddie Kalombo

Rhonda Ridenhower

Authorized for release by:
8/29/2018 9:03:00 PM

Rhonda Ridenhower, Manager of Project Management
(314)298-8566
rhonda.ridenhower@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29906-2

Job ID: 160-29906-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: Hunters Point Naval Shipyard - Parcel E2

Report Number: 160-29906-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup
Method 3620C: Florisil Cleanup
Method 3630C: Silica Gel Cleanup
Method 3640A: Gel-Permeation Cleanup
Method 3650B: Acid-Base Partition Cleanup
Method 3660B: Sulfur Cleanup

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29906-2

Job ID: 160-29906-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT
The samples were received on 08/01/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 20.5 C.

TOTAL BETA STRONTIUM (GFPC)
Sample PE2-RSYC8-U11-S001 (160-29906-1) was analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 08/02/2018, prepared on 08/07/2018 and analyzed on 08/23/2018.

The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: PE2-RSYC8-U11-S001 (160-29906-1). The samples contained detritus material and rocks of varying sizes.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)
Samples PE2-RSYC8-U11-S001 (160-29906-1), PE2-RSYC8-U11-S003 (160-29906-2), PE2-RSYC8-U11-S004 (160-29906-3), PE2-RSYC8-U11-S007 (160-29906-4), PE2-RSYC8-U11-S008 (160-29906-5), PE2-RSYC8-U11-S009 (160-29906-6), PE2-RSYC8-U11-S012 (160-29906-7), PE2-RSYC8-U11-S013 (160-29906-8), PE2-RSYC8-U11-S014 (160-29906-9) and PE2-RSYC8-U11-S017 (160-29906-10) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 08/02/2018, prepared on 08/03/2018 and analyzed on 08/24/2018 and 08/26/2018.

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline. PE2-RSYC8-U11-S008 (160-29906-5) and PE2-RSYC8-U11-S012 (160-29906-7),

The following sample exhibited a negative result greater in magnitude than the 3 sigma TPU: (MB 160-380196/1-A). This occurrence was evaluated and determined to be random in nature. Sporadic occurrences such as this are statistically expected. No further action is required.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

APTIM

CHAIN OF CUSTODY

Ref. Document # PE2_RSYC8_USE11_FWLeadOverEx#544

Page 1 of 1

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: *Nels Johnson*
(Name & phone #)

Send Report To: *Eddie Kalombo*
Phone/Fax Number: *415-987-0760*
Address: *4005 Port Chicago Hwy*
City: *Concord, CA, 94520*

Project Number: 500506
Project Name: CTO-013 RSYC8 USE 11 Freshwater Wetlands Lead Over-Excavation Systematic
Project Location: HPNS - Parcel E-2
Purchase Order #: 202296
Shipment/Pickup Date: 7.31.18
Waybill Number: 1266Y5451395066627
Lab Destination: TestAmerica (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63045
Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Sampler's Name(s): JOAQUIN RAMIREZ

Sample ID Number	Sample Description	Collection Information: Date	Time	Method	Matrix	# of containers	Container Type	Analyses Requested: Gamma Spec (EPA 191.1 M) (7 day in-growth preliminary results and full 21 day in growth for full gamma results)	Total Strontium (EPA 905 MOD)		Strontium 90 (EPA 905 MOD)			Dose Rate µR/Hr
							Preservative (water)							
							Preservative (soil)	N/A	N/A		N/A			
PE2-RSYC8-U11-S001	Parcel E-2 RSYC8 USE 11 Systematic	7/25/18	1235	G	SO	1	16 oz. plastic jar	X	X		X			5
PE2-RSYC8-U11-S003	Parcel E-2 RSYC8 USE 11 Systematic	7/25/18	1240	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYC8-U11-S004	Parcel E-2 RSYC8 USE 11 Systematic	7/25/18	1245	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYC8-U11-S007	Parcel E-2 RSYC8 USE 11 Systematic	7/25/18	1250	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYC8-U11-S008	Parcel E-2 RSYC8 USE 11 Systematic	7/25/18	1255	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYC8-U11-S009	Parcel E-2 RSYC8 USE 11 Systematic	7/25/18	1300	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYC8-U11-S012	Parcel E-2 RSYC8 USE 11 Systematic	7/25/18	1305	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYC8-U11-S013	Parcel E-2 RSYC8 USE 11 Systematic	7/25/18	1310	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYC8-U11-S014	Parcel E-2 RSYC8 USE 11 Systematic	7/25/18	1315	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYC8-U11-S017	Parcel E-2 RSYC8 USE 11 Systematic	7/25/18	1320	G	SO	1	16 oz. plastic jar	X						5

Special Instructions:
7 days ingrown draft and follow with 21 days final.
Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g.

☐ 24-hr
Standard TAT -10-day ☐ 3-day ☐ 10-day

Level Of QC Required: I II **III** Project Specific:

Relinquished By	Date / Time	Received By	Date / Time
JOAQUIN RAMIREZ	Date: 7.31.18 Time: 1000	EDDIE KALOMBO	Date: 7.31.18 Time: 1000
EDDIE KALOMBO	Date: 7.31.18 Time: 1600	Michael Hellin	Date: 8-1-18 Time: 0905
	Date: Time:		Date: Time:
	Date: Time:		Date: Time:

Method Codes C = Composite G = Grab

Matrix Codes
DW = Drinking Water SO = Soil
GW = Ground Water SL = Sludge
WW = Waste Water CP = Chip Samples
A = Air ABS=Asbestos, PO=Pipe Openning

160-29906 Chain of Custody

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-29906-2

Login Number: 29906

List Source: TestAmerica St. Louis

List Number: 1

Creator: McKinney, Gerrod E

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	20.5
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29906-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29906-2

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy

None = None

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29906-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-29906-1	PE2-RSYC8-U11-S001	Solid	07/25/18 12:35	08/01/18 09:05
160-29906-2	PE2-RSYC8-U11-S003	Solid	07/25/18 12:40	08/01/18 09:05
160-29906-3	PE2-RSYC8-U11-S004	Solid	07/25/18 12:45	08/01/18 09:05
160-29906-4	PE2-RSYC8-U11-S007	Solid	07/25/18 12:50	08/01/18 09:05
160-29906-5	PE2-RSYC8-U11-S008	Solid	07/25/18 12:55	08/01/18 09:05
160-29906-6	PE2-RSYC8-U11-S009	Solid	07/25/18 13:00	08/01/18 09:05
160-29906-7	PE2-RSYC8-U11-S012	Solid	07/25/18 13:05	08/01/18 09:05
160-29906-8	PE2-RSYC8-U11-S013	Solid	07/25/18 13:10	08/01/18 09:05
160-29906-9	PE2-RSYC8-U11-S014	Solid	07/25/18 13:15	08/01/18 09:05
160-29906-10	PE2-RSYC8-U11-S017	Solid	07/25/18 13:20	08/01/18 09:05

Client Sample Results

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29906-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Client Sample ID: PE2-RSYC8-U11-S001
Lab Sample ID: 160-29906-1
Date Collected: 07/25/18 12:35
Matrix: Solid
Date Received: 08/01/18 09:05

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.0393	U	0.0560	0.0561	0.331	0.0421	pCi/g	08/07/18 18:44	08/23/18 05:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*86.4*		*40 - 110*	*08/07/18 18:44*	*08/23/18 05:59*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.746**		0.220	0.233		0.0379	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Actinium-227	-0.478	U	1.07	1.07		0.862	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Bismuth-212	0.00138	U	0.899	0.899		0.739	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Bismuth-214	**0.826**		0.199	0.216		0.0858	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Cesium-137	-0.00437	U	0.0705	0.0705	0.0700	0.0576	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Cobalt-60	-0.0222	U	0.134	0.134	0.200	0.0498	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Lead-210	-1.06	U	2.41	2.41		2.02	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Lead-212	**0.610**		0.115	0.132		0.0500	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Lead-214	**0.754**		0.168	0.184		0.0785	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Potassium-40	**9.91**		1.67	1.95		0.419	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Protactinium-231	-1.14	U	3.91	3.91		3.18	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Radium-226	**0.826**		0.199	0.216	0.700	0.0858	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Radium-228	**0.746**		0.220	0.233		0.0379	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Thallium-208	**0.273**		0.0837	0.0882		0.0338	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Thorium-228	**0.610**		0.115	0.132		0.0500	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Thorium-232	**0.746**		0.220	0.233		0.0379	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Thorium-234	-0.0621	U	1.65	1.65		1.35	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Uranium-235	0.0988	U	0.232	0.232		0.566	pCi/g	08/03/18 15:06	08/26/18 23:18	1
Uranium-238	-0.0621	U	1.65	1.65		1.35	pCi/g	08/03/18 15:06	08/26/18 23:18	1

Client Sample ID: PE2-RSYC8-U11-S003
Lab Sample ID: 160-29906-2
Date Collected: 07/25/18 12:40
Matrix: Solid
Date Received: 08/01/18 09:05

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.255**		0.245	0.246		0.120	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Actinium-227	0.00983	U	0.00916	0.00923		0.771	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Bismuth-212	0.290	U	0.635	0.636		0.490	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Bismuth-214	**0.460**		0.147	0.154		0.0516	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Cesium-137	0.0364	U	0.0686	0.0687	0.0700	0.0533	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Cobalt-60	-0.00342	U	0.0579	0.0579	0.200	0.0284	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Lead-210	**1.25**		1.47	1.48		0.971	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Lead-212	**0.335**		0.0960	0.102		0.0568	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Lead-214	**0.500**		0.151	0.160		0.0683	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Potassium-40	**10.1**		1.45	1.77		0.120	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Protactinium-231	0.354	U	1.35	1.35		2.19	pCi/g	08/03/18 15:06	08/24/18 13:58	1

Client Sample Results

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29906-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Client Sample ID: PE2-RSYC8-U11-S003
Lab Sample ID: 160-29906-2
Date Collected: 07/25/18 12:40
Matrix: Solid
Date Received: 08/01/18 09:05

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.460**		0.147	0.154	0.700	0.0516	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Radium-228	**0.255**		0.245	0.246		0.120	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Thallium-208	**0.132**		0.0475	0.0493		0.0175	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Thorium-228	**0.335**		0.0960	0.102		0.0568	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Thorium-232	**0.255**		0.245	0.246		0.120	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Thorium-234	0.250	U	0.445	0.446		0.591	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Uranium-235	0.0482	U	0.510	0.510		0.419	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Uranium-238	0.250	U	0.445	0.446		0.591	pCi/g	08/03/18 15:06	08/24/18 13:58	1

Client Sample ID: PE2-RSYC8-U11-S004
Lab Sample ID: 160-29906-3
Date Collected: 07/25/18 12:45
Matrix: Solid
Date Received: 08/01/18 09:05

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.509**		0.172	0.180		0.0347	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Actinium-227	0.0165	U	0.656	0.656		0.453	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Bismuth-212	0.216	U	0.725	0.725		0.573	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Bismuth-214	**0.226**		0.110	0.112		0.218	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Cesium-137	0.00700	U	0.0607	0.0607	0.0700	0.0492	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Cobalt-60	0.0158	U	0.00797	0.00812	0.200	0.0549	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Lead-210	-0.460	U	1.71	1.71		1.22	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Lead-212	0.0128	U	0.157	0.157		0.129	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Lead-214	**0.479**		0.122	0.132		0.0540	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Potassium-40	**7.94**		1.42	1.63		0.268	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Protactinium-231	0.000	U	0.584	0.584		2.09	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Radium-226	**0.226**		0.110	0.112	0.700	0.218	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Radium-228	**0.509**		0.172	0.180		0.0347	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Thallium-208	**0.193**		0.0778	0.0803		0.0302	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Thorium-228	0.0128	U	0.157	0.157		0.129	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Thorium-232	**0.509**		0.172	0.180		0.0347	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Thorium-234	0.0448	U	1.17	1.17		0.957	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Uranium-235	0.0346	U	0.177	0.177		0.294	pCi/g	08/03/18 15:06	08/24/18 13:56	1
Uranium-238	0.0448	U	1.17	1.17		0.957	pCi/g	08/03/18 15:06	08/24/18 13:56	1

Client Sample ID: PE2-RSYC8-U11-S007
Lab Sample ID: 160-29906-4
Date Collected: 07/25/18 12:50
Matrix: Solid
Date Received: 08/01/18 09:05

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.174**		0.240	0.240		0.156	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Actinium-227	0.385	U	0.838	0.840		0.671	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Bismuth-212	0.390	U	1.03	1.03		0.814	pCi/g	08/03/18 15:06	08/24/18 13:57	1

Client Sample Results

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29906-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Client Sample ID: PE2-RSYC8-U11-S007
Lab Sample ID: 160-29906-4
Date Collected: 07/25/18 12:50
Matrix: Solid
Date Received: 08/01/18 09:05

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Bismuth-214	**0.370**		0.121	0.127		0.0447	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Cesium-137	0.0278	U	0.0642	0.0643	0.0700	0.0496	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Cobalt-60	**0.0711**		0.0479	0.0485	0.200	0.0162	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Lead-210	-1.29	U	1.33	1.33		1.40	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Lead-212	**0.367**		0.140	0.147		0.0960	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Lead-214	**0.425**		0.123	0.130		0.0663	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Potassium-40	**8.79**		1.63	1.86		0.325	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Protactinium-231	-0.959	U	2.68	2.68		2.16	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Radium-226	**0.370**		0.121	0.127	0.700	0.0447	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Radium-228	**0.174**		0.240	0.240		0.156	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Thallium-208	**0.135**		0.0554	0.0571		0.0209	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Thorium-228	**0.367**		0.140	0.147		0.0960	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Thorium-232	**0.174**		0.240	0.240		0.156	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Thorium-234	-0.645	U	1.10	1.10		1.35	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Uranium-235	0.0687	U	0.183	0.183		0.408	pCi/g	08/03/18 15:06	08/24/18 13:57	1
Uranium-238	-0.645	U	1.10	1.10		1.35	pCi/g	08/03/18 15:06	08/24/18 13:57	1

Client Sample ID: PE2-RSYC8-U11-S008
Lab Sample ID: 160-29906-5
Date Collected: 07/25/18 12:55
Matrix: Solid
Date Received: 08/01/18 09:05

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**1.30**		0.270	0.301		0.158	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Actinium-227	-0.158	U	1.19	1.19		0.815	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Bismuth-212	0.849	U	1.63	1.63		1.29	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Bismuth-214	**1.22**		0.233	0.265		0.0895	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Cesium-137	0.0492	U	0.0944	0.0946	0.0700	0.0735	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Cobalt-60	0.00576	U	0.129	0.129	0.200	0.0658	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Lead-210	0.467	U	1.70	1.70		1.27	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Lead-212	**1.08**		0.166	0.218		0.0721	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Lead-214	**1.22**		0.200	0.236		0.101	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Potassium-40	**17.3**		2.28	2.88		0.441	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Protactinium-231	-0.181	U	4.31	4.31		3.54	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Radium-226	**1.22**		0.233	0.265	0.700	0.0895	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Radium-228	**1.30**		0.270	0.301		0.158	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Thallium-208	**0.311**		0.0919	0.0974		0.0373	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Thorium-228	**1.08**		0.166	0.218		0.0721	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Thorium-232	**1.30**		0.270	0.301		0.158	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Thorium-234	**3.19**		2.02	2.04		1.21	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Uranium-235	0.140	U	0.527	0.528		0.428	pCi/g	08/03/18 15:06	08/24/18 13:58	1
Uranium-238	**3.19**		2.02	2.04		1.21	pCi/g	08/03/18 15:06	08/24/18 13:58	1

Client Sample Results

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29906-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Client Sample ID: PE2-RSYC8-U11-S009
Lab Sample ID: 160-29906-6
Date Collected: 07/25/18 13:00
Matrix: Solid
Date Received: 08/01/18 09:05

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.733**		0.189	0.203		0.0377	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Actinium-227	0.303	U	0.504	0.505		0.647	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Bismuth-212	0.335	U	1.09	1.09		0.873	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Bismuth-214	**0.560**		0.147	0.158		0.0483	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Cesium-137	0.0382	U	0.0702	0.0703	0.0700	0.0538	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Cobalt-60	-0.0221	U	0.0832	0.0833	0.200	0.0496	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Lead-210	-1.21	U	2.06	2.07		1.74	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Lead-212	**0.280**		0.100	0.104		0.0614	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Lead-214	**0.435**		0.126	0.133		0.0702	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Potassium-40	**12.9**		1.88	2.29		0.417	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Protactinium-231	-1.02	U	3.06	3.06		2.48	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Radium-226	**0.560**		0.147	0.158	0.700	0.0483	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Radium-228	**0.733**		0.189	0.203		0.0377	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Thallium-208	**0.232**		0.0741	0.0778		0.0267	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Thorium-228	**0.280**		0.100	0.104		0.0614	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Thorium-232	**0.733**		0.189	0.203		0.0377	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Thorium-234	-0.134	U	1.47	1.47		1.21	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Uranium-235	-0.0568	U	0.324	0.324		0.263	pCi/g	08/03/18 15:06	08/24/18 13:59	1
Uranium-238	-0.134	U	1.47	1.47		1.21	pCi/g	08/03/18 15:06	08/24/18 13:59	1

Client Sample ID: PE2-RSYC8-U11-S012
Lab Sample ID: 160-29906-7
Date Collected: 07/25/18 13:05
Matrix: Solid
Date Received: 08/01/18 09:05

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.601**		0.161	0.172		0.0442	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Actinium-227	-0.234	U	0.758	0.758		0.513	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Bismuth-212	0.298	U	0.876	0.876		0.687	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Bismuth-214	**0.598**		0.147	0.159		0.0353	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Cesium-137	0.0186	U	0.0877	0.0877	0.0700	0.0703	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Cobalt-60	0.000	U	0.0152	0.0152	0.200	0.0177	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Lead-210	-0.350	U	1.46	1.46		1.06	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Lead-212	**0.466**		0.101	0.117		0.0396	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Lead-214	**0.665**		0.154	0.169		0.0499	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Potassium-40	**10.8**		1.88	2.18		0.362	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Protactinium-231	0.783	U	1.99	1.99		2.19	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Radium-226	**0.598**		0.147	0.159	0.700	0.0353	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Radium-228	**0.601**		0.161	0.172		0.0442	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Thallium-208	**0.252**		0.0734	0.0780		0.0176	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Thorium-228	**0.466**		0.101	0.117		0.0396	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Thorium-232	**0.601**		0.161	0.172		0.0442	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Thorium-234	-0.111	U	1.18	1.18		0.973	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Uranium-235	0.00856	U	0.121	0.121		0.315	pCi/g	08/03/18 15:06	08/24/18 14:37	1
Uranium-238	-0.111	U	1.18	1.18		0.973	pCi/g	08/03/18 15:06	08/24/18 14:37	1

Client Sample Results

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29906-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Client Sample ID: PE2-RSYC8-U11-S013
Lab Sample ID: 160-29906-8
Date Collected: 07/25/18 13:10
Matrix: Solid
Date Received: 08/01/18 09:05

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.533**		0.180	0.188		0.105	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Actinium-227	-0.0388	U	0.0614	0.0616		0.378	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Bismuth-212	-0.256	U	0.734	0.735		0.583	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Bismuth-214	**0.388**		0.118	0.124		0.0457	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Cesium-137	-0.0362	U	0.0828	0.0829	0.0700	0.0457	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Cobalt-60	-0.0348	U	0.0675	0.0676	0.200	0.0462	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Lead-210	-0.0428	U	1.09	1.09		0.893	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Lead-212	**0.364**		0.0999	0.110		0.0486	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Lead-214	**0.408**		0.124	0.131		0.0786	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Potassium-40	**9.71**		1.39	1.71		0.196	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Protactinium-231	0.537	U	1.49	1.49		1.59	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Radium-226	**0.388**		0.118	0.124	0.700	0.0457	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Radium-228	**0.533**		0.180	0.188		0.105	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Thallium-208	**0.142**		0.0567	0.0586		0.0244	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Thorium-228	**0.364**		0.0999	0.110		0.0486	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Thorium-232	**0.533**		0.180	0.188		0.105	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Thorium-234	0.0127	U	0.839	0.839		0.688	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Uranium-235	0.102	U	0.324	0.325		0.292	pCi/g	08/03/18 15:06	08/24/18 14:38	1
Uranium-238	0.0127	U	0.839	0.839		0.688	pCi/g	08/03/18 15:06	08/24/18 14:38	1

Client Sample ID: PE2-RSYC8-U11-S014
Lab Sample ID: 160-29906-9
Date Collected: 07/25/18 13:15
Matrix: Solid
Date Received: 08/01/18 09:05

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.600**		0.156	0.168		0.0359	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Actinium-227	0.277	U	0.412	0.413		0.558	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Bismuth-212	0.254	U	0.750	0.751		0.590	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Bismuth-214	**0.190**		0.146	0.148		0.173	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Cesium-137	0.0132	U	0.0717	0.0717	0.0700	0.0574	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Cobalt-60	0.0204	U	0.0757	0.0758	0.200	0.0420	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Lead-210	0.670	U	1.54	1.55		1.24	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Lead-212	0.0285	U	0.124	0.124		0.101	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Lead-214	**0.399**		0.107	0.114		0.0456	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Potassium-40	**11.6**		1.86	2.21		0.443	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Protactinium-231	0.591	U	1.87	1.87		1.51	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Radium-226	**0.190**		0.146	0.148	0.700	0.173	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Radium-228	**0.600**		0.156	0.168		0.0359	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Thallium-208	**0.109**		0.0830	0.0838		0.0352	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Thorium-228	0.0285	U	0.124	0.124		0.101	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Thorium-232	**0.600**		0.156	0.168		0.0359	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Thorium-234	-0.362	U	1.40	1.40		1.17	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Uranium-235	0.153	U	0.332	0.333		0.319	pCi/g	08/03/18 15:06	08/24/18 14:40	1
Uranium-238	-0.362	U	1.40	1.40		1.17	pCi/g	08/03/18 15:06	08/24/18 14:40	1

Client Sample Results

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29906-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Client Sample ID: PE2-RSYC8-U11-S017
Lab Sample ID: 160-29906-10
Date Collected: 07/25/18 13:20
Matrix: Solid
Date Received: 08/01/18 09:05

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.347**		0.110	0.115		0.0202	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Actinium-227	0.191	U	0.425	0.425		0.338	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Bismuth-212	0.000	U	0.449	0.449		0.458	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Bismuth-214	**0.363**		0.0939	0.101		0.0349	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Cesium-137	0.0249	U	0.0400	0.0401	0.0700	0.0305	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Cobalt-60	0.00889	U	0.0397	0.0397	0.200	0.0189	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Lead-210	0.0926	U	1.10	1.10		0.903	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Lead-212	**0.324**		0.0697	0.0813		0.0365	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Lead-214	**0.343**		0.0945	0.101		0.0385	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Potassium-40	**10.1**		1.21	1.59		0.213	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Protactinium-231	0.000	U	0.552	0.552		1.32	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Radium-226	**0.363**		0.0939	0.101	0.700	0.0349	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Radium-228	**0.347**		0.110	0.115		0.0202	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Thallium-208	**0.0920**		0.0339	0.0352		0.0128	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Thorium-228	**0.324**		0.0697	0.0813		0.0365	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Thorium-232	**0.347**		0.110	0.115		0.0202	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Thorium-234	0.315	U	0.877	0.877		0.708	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Uranium-235	0.0754	U	0.148	0.148		0.259	pCi/g	08/03/18 15:06	08/24/18 14:39	1
Uranium-238	0.315	U	0.877	0.877		0.708	pCi/g	08/03/18 15:06	08/24/18 14:39	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29906-2

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-380968/22-A
Matrix: Solid
Analysis Batch: 384724

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 380968

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.02050	U	0.0574	0.0574	0.331	0.0492	pCi/g	08/07/18 18:44	08/23/18 06:02	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*81.9*		*40 - 110*	*08/07/18 18:44*	*08/23/18 06:02*	*1*

Lab Sample ID: LCS 160-380968/1-A
Matrix: Solid
Analysis Batch: 384726

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 380968

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2 +/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits		
Total Beta Strontium			8.20	7.829		0.640	0.331	0.0503	pCi/g	95	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*83.0*		*40 - 110*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-380196/1-A
Matrix: Solid
Analysis Batch: 385325

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 380196

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.1436		0.128	0.129		0.0480	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Actinium-227	-0.2899	U	0.923	0.924		0.744	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Bismuth-212	-0.3726	U	0.957	0.958		0.643	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Bismuth-214	0.08845	U	0.100	0.101		0.144	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Cesium-137	0.02491	U	0.0730	0.0731	0.0700	0.0570	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Cobalt-60	-0.06007	U	0.0386	0.0391	0.200	0.0631	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Lead-210	1.567		1.64	1.66		1.13	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Lead-212	-0.01067	U	0.114	0.114		0.0942	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Lead-214	0.07970		0.0954	0.0958		0.0585	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Potassium-40	-1.075	U	0.787	0.795		0.825	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Protactinium-231	0.0000	U	0.436	0.436		2.65	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Radium-226	0.08845	U	0.100	0.101	0.700	0.144	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Radium-228	0.1436		0.128	0.129		0.0480	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Thallium-208	-0.09302	U	0.0736	0.0742		0.0741	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Thorium-228	-0.01067	U	0.114	0.114		0.0942	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Thorium-232	0.1436		0.128	0.129		0.0480	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Thorium-234	-0.4888	U	1.55	1.55		1.29	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Uranium-235	0.0000	U	0.224	0.224		0.481	pCi/g	08/03/18 15:06	08/27/18 01:43	1
Uranium-238	-0.4888	U	1.55	1.55		1.29	pCi/g	08/03/18 15:06	08/27/18 01:43	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29906-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-380196/2-A
Matrix: Solid
Analysis Batch: 385104

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 380196

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2 +/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits		
Americium-241			96.8	103.5		10.8		0.548	pCi/g	107	87 - 116		
Cesium-137			28.2	27.36		2.93	0.0700	0.112	pCi/g	97	87 - 120		
Cobalt-60			12.8	13.02		1.37	0.200	0.0424	pCi/g	102	87 - 115		

Lab Sample ID: 160-29906-1 DU
Matrix: Solid
Analysis Batch: 385100

Client Sample ID: PE2-RSYC8-U11-S001
Prep Type: Total/NA
Prep Batch: 380196

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2 +/-)	LOQ	DLC	Unit			RER	RER Limit
Actinium 228	0.746			0.6232		0.252		0.161	pCi/g			0.25	1
Actinium-227	-0.478	U		-0.3375	U	0.910		0.734	pCi/g			0.07	1
Bismuth-212	0.00138	U		0.4122	U	0.759		0.582	pCi/g			0.25	1
Bismuth-214	0.826			0.6642		0.158		0.0297	pCi/g			0.43	1
Cesium-137	-0.00437	U		-0.03869	U	0.0907	0.0700	0.0720	pCi/g			0.21	1
Cobalt-60	-0.0222	U		0.03431	U	0.0290	0.200	0.0418	pCi/g			0.35	1
Lead-210	-1.06	U		1.126		1.46		0.972	pCi/g			0.56	1
Lead-212	0.610			0.4442		0.117		0.0605	pCi/g			0.67	1
Lead-214	0.754			0.6893		0.172		0.0626	pCi/g			0.18	1
Potassium-40	9.91			11.53		1.96		0.125	pCi/g			0.42	1
Protactinium-231	-1.14	U		-0.9450	U	3.32		2.71	pCi/g			0.03	1
Radium-226	0.826			0.6642		0.158	0.700	0.0297	pCi/g			0.43	1
Radium-228	0.746			0.6232		0.252		0.161	pCi/g			0.25	1
Thallium-208	0.273			0.3202		0.0954		0.0315	pCi/g			0.26	1
Thorium-228	0.610			0.4442		0.117		0.0605	pCi/g			0.67	1
Thorium-232	0.746			0.6232		0.252		0.161	pCi/g			0.25	1
Thorium-234	-0.0621	U		-0.2103	U	1.59		1.31	pCi/g			0.05	1
Uranium-235	0.0988	U		-0.02560	U	0.0510		0.484	pCi/g			0.44	1
Uranium-238	-0.0621	U		-0.2103	U	1.59		1.31	pCi/g			0.05	1

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29906-2

Rad

Leach Batch: 379930

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29906-1	PE2-RSYC8-U11-S001	Total/NA	Solid	Dry and Grind	
160-29906-2	PE2-RSYC8-U11-S003	Total/NA	Solid	Dry and Grind	
160-29906-3	PE2-RSYC8-U11-S004	Total/NA	Solid	Dry and Grind	
160-29906-4	PE2-RSYC8-U11-S007	Total/NA	Solid	Dry and Grind	
160-29906-5	PE2-RSYC8-U11-S008	Total/NA	Solid	Dry and Grind	
160-29906-6	PE2-RSYC8-U11-S009	Total/NA	Solid	Dry and Grind	
160-29906-7	PE2-RSYC8-U11-S012	Total/NA	Solid	Dry and Grind	
160-29906-8	PE2-RSYC8-U11-S013	Total/NA	Solid	Dry and Grind	
160-29906-9	PE2-RSYC8-U11-S014	Total/NA	Solid	Dry and Grind	
160-29906-10	PE2-RSYC8-U11-S017	Total/NA	Solid	Dry and Grind	
160-29906-1 DU	PE2-RSYC8-U11-S001	Total/NA	Solid	Dry and Grind	

Prep Batch: 380196

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29906-1	PE2-RSYC8-U11-S001	Total/NA	Solid	Fill_Geo-21	379930
160-29906-2	PE2-RSYC8-U11-S003	Total/NA	Solid	Fill_Geo-21	379930
160-29906-3	PE2-RSYC8-U11-S004	Total/NA	Solid	Fill_Geo-21	379930
160-29906-4	PE2-RSYC8-U11-S007	Total/NA	Solid	Fill_Geo-21	379930
160-29906-5	PE2-RSYC8-U11-S008	Total/NA	Solid	Fill_Geo-21	379930
160-29906-6	PE2-RSYC8-U11-S009	Total/NA	Solid	Fill_Geo-21	379930
160-29906-7	PE2-RSYC8-U11-S012	Total/NA	Solid	Fill_Geo-21	379930
160-29906-8	PE2-RSYC8-U11-S013	Total/NA	Solid	Fill_Geo-21	379930
160-29906-9	PE2-RSYC8-U11-S014	Total/NA	Solid	Fill_Geo-21	379930
160-29906-10	PE2-RSYC8-U11-S017	Total/NA	Solid	Fill_Geo-21	379930
MB 160-380196/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-380196/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-29906-1 DU	PE2-RSYC8-U11-S001	Total/NA	Solid	Fill_Geo-21	379930

Prep Batch: 380968

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29906-1	PE2-RSYC8-U11-S001	Total/NA	Solid	DPS-0	379930
MB 160-380968/22-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-380968/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29906-2

Method: 905.0 - Total Beta Strontium (GFPC)

Matrix: Solid

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)							
Lab Sample ID	Client Sample ID	Sr Carrier (40-110)							
160-29906-1	PE2-RSYC8-U11-S001	86.4							
LCS 160-380968/1-A	Lab Control Sample	83.0							
MB 160-380968/22-A	Method Blank	81.9							

Tracer/Carrier Legend

Sr Carrier = Sr Carrier

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-29329-3
TestAmerica Sample Delivery Group: Recount Request
Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Eddie Kalombo

Rhonda Ridenhower

Authorized for release by:
8/15/2018 11:28:39 AM

Rhonda Ridenhower, Manager of Project Management
(314)298-8566
rhonda.ridenhower@testamericainc.com

Table of Contents

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-3
SDG: Recount Request

Job ID: 160-29329-3

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: Hunters Point Naval Shipyard - Parcel E2

Report Number: 160-29329-3

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup
Method 3620C: Florisil Cleanup
Method 3630C: Silica Gel Cleanup
Method 3640A: Gel-Permeation Cleanup
Method 3650B: Acid-Base Partition Cleanup
Method 3660B: Sulfur Cleanup
Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-3
SDG: Recount Request

Job ID: 160-29329-3 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

RECEIPT

The samples were received on 07/05/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 19.0 C.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples PE2-RSYC8-U11-S002 (160-29329-1) and PE2-RSYC8-U11-S010 (160-29329-4) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 07/05/2018 and 08/07/2018, and prepared and analyzed on 08/07/2018.

PE2-RSYC8-U11-S002 (160-29329-1) was recounted three times, as each count did not verify the original 7 and 21-day counts. The original recount is reported, all three recounts verify one another. The original 7-day and 21-day counts appear to be anomalous.

PE2-RSYC8-U11-S010 (160-29329-4) was recounted and verifies the 7-day result. The 21-day result appears to be an anomaly.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

APTIM

CHAIN OF CUSTODY

Ref. Document # PE2_RSYC8_USE11_FWLeadOverEx#544

Page 1 of 2

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: *Nels Johnson*
(Name & phone #)

Send Report To: *Eddie Kalombo*
Phone/Fax Number: *415-987-0760*
Address: *4005 Port Chicago Hwy*
City: *Concord, CA, 94520*
Sampler's Name(s): JOAQUIN RAMIREZ

Project Number: 500506
Project Name: CTO-013 RSYC8 USE 11 Freshwater Wetlands Lead Over-Excavation Systematic
Project Location: HPNS - Parcel E-2
Purchase Order #: 202296
Shipment/Pickup Date: 7.2.18
Waybill Number:
Lab Destination: TestAmerica (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63045
Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Sample ID Number	Sample Description	Collection Information: Date	Time	Method	Matrix	# of containers	Preservative (water) / Preservative (soil) / Container Type	Analyses Requested: Gamma Spec (EPA 191.1 M) - (7 day in-growth preliminary results and full 21 day in growth for full gamma results)	Total Strontium (EPA 905 MOD)		Strontium 90 (EPA 905 MOD)			Dose Rate µR/Hr
							Preservative (soil)	N/A	N/A		N/A			
~~PE2-RSYC8-U11-S001~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~	~~X~~		~~X~~			
PE2-RSYC8-U11-S002	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1120	G	SO	1	16 oz. plastic jar	X						5
~~PE2-RSYC8-U11-S003~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~						
~~PE2-RSYC8-U11-S004~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~						X JL 6/29/18
PE2-RSYC8-U11-S005	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1123	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYC8-U11-S006	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1210	G	SO	1	16 oz. plastic jar	X						5
~~PE2-RSYC8-U11-S007~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~						
~~PE2-RSYC8-U11-S008~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~						
~~PE2-RSYC8-U11-S009~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~						
PE2-RSYC8-U11-S010	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1213	G	SO	1	16 oz. plastic jar	X						5

160-29329 Chain of Custody

Special Instructions:

7 days ingrown draft and follow with 21 days final.
Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g.

☐ 24-hr
Standard TAT -10-day ☐ 3-day ☐ 10-day

Level Of QC Required: I II III Project Specific:

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
JOAQUIN RAMIREZ	6/29/2018	1100	EDDIE KALOMBO	6.29.18	1100
EDDIE KALOMBO	7.2.18	1600	Nicholas Press	7/5/18	0840

Method Codes C = Composite G = Grab

Matrix Codes
DW = Drinking Water SO = Soil
GW = Ground Water SL = Sludge
WW = Waste Water CP = Chip Samples
A = Air ABS=Asbestos, PO=Pipe Openning

APTIM

CHAIN OF CUSTODY

Ref. Document # PE2_RSYC8_USE11_FWLeadOverEx#544

Page 2 of 2

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: *Nels Johnson*
(Name & phone #)

Send Report To: *Eddie Kalombo*
Phone/Fax Number: *415-987-0760*
Address: *4005 Port Chicago Hwy*
City: *Concord, CA, 94520*
Sampler's Name(s): JOAQUIN RAMIREZ

Project Number: 500506
Project Name: CTO-013 RSYC8 USE 11 Freshwater Wetlands Lead Over-Excavation Systematic
Project Location: HPNS - Parcel E-2
Purchase Order #: 202296
Shipment/Pickup Date: 7.2.18
Waybill Number:
Lab Destination: TestAmerica (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63045
Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Sample ID Number	Sample Description	Collection Information: Date	Time	Method	Matrix	# of containers	Preservative (water) / Preservative (soil) / Container Type	Analyses Requested: Gamma Spec (EPA 191.1 M) – (7 day in-growth preliminary results and full 21 day in growth for full gamma results)	Total Strontium (EPA 905 MOD)		Strontium 90 (EPA 905 MOD)			Dose Rate µR/Hr	
							Preservative (water)								
							Preservative (soil)	N/A	N/A		N/A				
							Container Type								
PE2-RSYC8-U11-S011	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1216	G	SO	1	16 oz. plastic jar	X	X		X			5	
~~PE2-RSYC8-U11-S012~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~							
~~PE2-RSYC8-U11-S013~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~							
~~PE2-RSYC8-U11-S014~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~							
PE2-RSYC8-U11-S015	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1219	G	SO	1	16 oz. plastic jar	X						5	
PE2-RSYC8-U11-S016	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1221	G	SO	1	16 oz. plastic jar	X						5	
~~PE2-RSYC8-U11-S017~~	~~Parcel E-2 RSYC8 USE 11 Systematic~~			~~G~~	~~SO~~	~~1~~	~~16 oz. plastic jar~~	~~X~~							
PE2-RSYC8-U11-S018	Parcel E-2 RSYC8 USE 11 Systematic	6/29/18	1224	G	SO	1	16 oz. plastic jar	X						5	

Special Instructions:
7 days ingrown draft and follow with 21 days final.
Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g.

☐ 24-hr
Standard TAT -10-day ☐ 3-day ☐ 10-day

Level Of QC Required: I II **III** Project Specific:

Relinquished By	Date/Time	Received By	Date/Time
JOAQUIN RAMIREZ	6/29/18 1100	EDDIE KALOMBO	6.29.18 1100
EDDIE KALOMBO	7.2.18 1600	Nicholas Rego	7/5/18 0840

Method Codes C = Composite G = Grab

Matrix Codes
DW = Drinking Water SO = Soil
GW = Ground Water SL = Sludge
WW = Waste Water CP = Chip Samples
A = Air ABS=Asbestos, PO=Pipe Openning

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-29329-3
SDG Number: Recount Request

Login Number: 29329
List Number: 1
Creator: Press, Nicholas B

List Source: TestAmerica St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-3
SDG: Recount Request

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-3
SDG: Recount Request

Method	Method Description	Protocol	Laboratory
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy
None = None

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-3
SDG: Recount Request

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-29329-1	PE2-RSYC8-U11-S002	Solid	06/29/18 11:20	07/05/18 08:40
160-29329-4	PE2-RSYC8-U11-S010	Solid	06/29/18 12:13	07/05/18 08:40

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-3
SDG: Recount Request

Client Sample ID: PE2-RSYC8-U11-S002

Lab Sample ID: 160-29329-1
Date Collected: 06/29/18 11:20
Matrix: Solid
Date Received: 07/05/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.706**		0.186	0.199		0.0668	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Actinium-227	0.238	U	0.608	0.609		0.409	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Bismuth-212	**1.39**		0.517	0.537		0.109	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Bismuth-214	**0.634**		0.155	0.169		0.0529	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Cesium-137	-0.0475	U	0.0874	0.0875	0.0700	0.0684	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Cobalt-60	0.0201	U	0.0651	0.0651	0.200	0.0318	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Lead-210	-0.294	U	1.50	1.50		1.08	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Lead-212	**0.525**		0.114	0.133		0.0629	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Lead-214	**0.518**		0.119	0.131		0.0577	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Potassium-40	**10.0**		1.56	1.87		0.258	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Protactinium-231	0.565	U	1.76	1.76		1.93	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Radium-226	**0.634**		0.155	0.169	0.700	0.0529	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Radium-228	**0.706**		0.186	0.199		0.0668	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Thallium-208	**0.199**		0.0855	0.0880		0.0359	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Thorium-228	**0.525**		0.114	0.133		0.0629	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Thorium-232	**0.706**		0.186	0.199		0.0668	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Thorium-234	0.0207	U	1.29	1.29		1.05	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Uranium-235	0.117	U	0.282	0.282		0.280	pCi/g	08/07/18 11:01	08/07/18 12:13	1
Uranium-238	0.0207	U	1.29	1.29		1.05	pCi/g	08/07/18 11:01	08/07/18 12:13	1

Client Sample ID: PE2-RSYC8-U11-S010

Lab Sample ID: 160-29329-4
Date Collected: 06/29/18 12:13
Matrix: Solid
Date Received: 07/05/18 08:40

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.473**		0.153	0.161		0.0564	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Actinium-227	0.137	U	0.895	0.895		0.731	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Bismuth-212	-0.0469	U	0.845	0.845		0.692	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Bismuth-214	**0.621**		0.143	0.156		0.0477	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Cesium-137	0.000	U	0.0503	0.0503	0.0700	0.0707	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Cobalt-60	**0.0497**		0.0257	0.0261	0.200	0.0307	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Lead-210	0.595	U	1.69	1.69		1.14	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Lead-212	**0.415**		0.100	0.109		0.0521	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Lead-214	**0.721**		0.147	0.165		0.0590	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Potassium-40	**12.5**		1.67	2.09		0.130	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Protactinium-231	-0.851	U	3.32	3.32		2.70	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Radium-226	**0.621**		0.143	0.156	0.700	0.0477	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Radium-228	**0.473**		0.153	0.161		0.0564	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Thallium-208	**0.227**		0.0607	0.0649		0.0131	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Thorium-228	**0.415**		0.100	0.109		0.0521	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Thorium-232	**0.473**		0.153	0.161		0.0564	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Thorium-234	-0.183	U	1.67	1.67		1.38	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Uranium-235	-0.0481	U	0.396	0.396		0.429	pCi/g	08/07/18 11:01	08/07/18 12:12	1
Uranium-238	-0.183	U	1.67	1.67		1.38	pCi/g	08/07/18 11:01	08/07/18 12:12	1

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29329-3
SDG: Recount Request

Rad

Leach Batch: 374210

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29329-1	PE2-RSYC8-U11-S002	Total/NA	Solid	Dry and Grind	

Leach Batch: 380915

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29329-4	PE2-RSYC8-U11-S010	Total/NA	Solid	Dry and Grind	

Prep Batch: 380916

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29329-1	PE2-RSYC8-U11-S002	Total/NA	Solid	Fill_Geo-21	374210
160-29329-4	PE2-RSYC8-U11-S010	Total/NA	Solid	Fill_Geo-21	380915

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-29414-2
Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Eddie Kalombo

Rhonda Ridenhower

Authorized for release by:
8/7/2018 4:24:13 PM

Rhonda Ridenhower, Manager of Project Management
(314)298-8566
rhonda.ridenhower@testamericainc.com

Table of Contents

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29414-2

Job ID: 160-29414-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: Hunters Point Naval Shipyard - Parcel E2

Report Number: 160-29414-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup
Method 3620C: Florisil Cleanup
Method 3630C: Silica Gel Cleanup
Method 3640A: Gel-Permeation Cleanup
Method 3650B: Acid-Base Partition Cleanup
Method 3660B: Sulfur Cleanup

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29414-2

Job ID: 160-29414-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT
The samples were received on 07/10/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 19.0 C.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)
Samples PE2-RSYC8-U11-LLRO-S001 (160-29414-1), PE2-RSYC8-U11-LLRO-S002 (160-29414-2), PE2-RSYC8-U11-LLRO-S003 (160-29414-3) and PE2-RSYC8-U11-LLRO-S004 (160-29414-4) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 07/10/2018, prepared on 07/15/2018 and analyzed on 08/05/2018 and 08/06/2018.

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline.
PE2-RSYC8-U11-LLRO-S003 (160-29414-3)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

APTIM

CHAIN OF CUSTODY

Ref. Document # PE2_RSYC8_USE11_LLRO_070318-1#554

Page 1 of 1

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: *Nels Johnson*
(Name & phone #)

Send Report To: *Eddie Kalombo*
Phone/Fax Number: *415-987-0760*
Address: *4005 Port Chicago Hwy*
City: *Concord, CA, 94520*
Sampler's Name(s): JOAQUIN RAMIREZ

Project Number: 500506
Project Name: CTO-013 RSYC8 USE 11 Low Level Radiological Object # 070318-1
Project Location: HPNS - Parcel E-2
Purchase Order #: 202296
Shipment/Pickup Date: 7.9.18
Waybill Number: 126645455 1379191345
Lab Destination: TestAmerica (St. Louis Lab)
13715 Rider Trail North
Earth City, MO 63045
Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Sample ID Number	Sample Description	Collection Information: Date	Time	Method	Matrix	# of containers	Preservative (water) / Preservative (soil) / Container Type	Analyses Requested: Gamma Spec (EPA 191.1 M) – (7 day in-growth preliminary results and full 21 day in growth for full gamma results)	Total Strontium (EPA 905 MOD)	Strontium 90 (EPA 905 MOD)	Dose Rate µR/Hr
							Preservative (water)				
							Preservative (soil)	N/A	N/A	N/A	
PE2-RSYC8-U11-LLRO-S001	Parcel E-2 RSYC8 USE 11 Surrounding Commodity #070318-1 (NW)	7/3/18	1235	G	SO	1	16 oz. plastic jar	X			5
PE2-RSYC8-U11-LLRO-S002	Parcel E-2 RSYC8 USE 11 Surrounding Commodity #070318-1 (NE)	7/3/18	1238	G	SO	1	16 oz. plastic jar	X			5
PE2-RSYC8-U11-LLRO-S003	Parcel E-2 RSYC8 USE 11 Surrounding Commodity #070318-1 (SE)	7/3/18	1242	G	SO	1	16 oz. plastic jar	X			5
PE2-RSYC8-U11-LLRO-S004	Parcel E-2 RSYC8 USE 11 Surrounding Commodity #070318-1 (SW)	7/3/18	1245	G	SO	1	16 oz. plastic jar	X			5

160-29414 Chain of Custody

Special Instructions:
7 days Ingrown draft and follow with 21 days final.
Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g.

☐ 24-hr
Standard TAT -10-day ☐ 3-day ☐ 10-day

Level Of QC Required: I II III Project Specific:

Relinquished By	Date/Time	Received By	Date/Time
JOAQUIN RAMIREZ	Date: 7/3/2018 Time: 1400	EDDIE KALOMBO	Date: 7.3.18 Time: 1400
EDDIE KALOMBO	Date: 7.9.18 Time: 1600		Date: 7/10/18 Time: 0850
	Date: Time:		Date: Time:
	Date: Time:		Date: Time:

Method Codes C = Composite G = Grab

Matrix Codes
DW = Drinking Water SO = Soil
GW = Ground Water SL = Sludge
WW = Waste Water CP = Chip Samples
A = Air ABS=Asbestos, PO=Pipe Openning

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-29414-2

Login Number: 29414
List Number: 1
Creator: Press, Nicholas B

List Source: TestAmerica St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29414-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29414-2

Method	Method Description	Protocol	Laboratory
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy
None = None

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29414-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-29414-1	PE2-RSYC8-U11-LLRO-S001	Solid	07/03/18 12:35	07/10/18 08:50
160-29414-2	PE2-RSYC8-U11-LLRO-S002	Solid	07/03/18 12:38	07/10/18 08:50
160-29414-3	PE2-RSYC8-U11-LLRO-S003	Solid	07/03/18 12:42	07/10/18 08:50
160-29414-4	PE2-RSYC8-U11-LLRO-S004	Solid	07/03/18 12:45	07/10/18 08:50

Client Sample Results

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29414-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Client Sample ID: PE2-RSYC8-U11-LLRO-S001
Lab Sample ID: 160-29414-1

Date Collected: 07/03/18 12:35
Matrix: Solid
Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.241**		0.0951	0.0982		0.0998	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Actinium-227	-0.0707	U	0.544	0.544		0.444	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Bismuth-212	-0.0155	U	0.605	0.605		0.497	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Bismuth-214	**0.330**		0.122	0.127		0.0512	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Cesium-137	-0.0239	U	0.0415	0.0416	0.0700	0.0489	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Cobalt-60	**0.0363**		0.0242	0.0244	0.200	0.00874	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Lead-210	0.222	U	0.991	0.991		0.803	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Lead-212	**0.258**		0.0643	0.0725		0.0331	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Lead-214	**0.321**		0.103	0.108		0.0446	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Potassium-40	**11.8**		1.37	1.83		0.239	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Protactinium-231	0.343	U	1.14	1.14		1.82	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Radium-226	**0.330**		0.122	0.127	0.700	0.0512	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Radium-228	**0.241**		0.0951	0.0982		0.0998	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Thallium-208	**0.151**		0.0451	0.0477		0.0150	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Thorium-228	**0.258**		0.0643	0.0725		0.0331	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Thorium-232	**0.241**		0.0951	0.0982		0.0998	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Thorium-234	-0.525	U	1.12	1.12		0.902	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Uranium-235	0.0696	U	0.332	0.332		0.328	pCi/g	07/15/18 22:28	08/05/18 20:42	1
Uranium-238	-0.525	U	1.12	1.12		0.902	pCi/g	07/15/18 22:28	08/05/18 20:42	1

Client Sample ID: PE2-RSYC8-U11-LLRO-S002
Lab Sample ID: 160-29414-2

Date Collected: 07/03/18 12:38
Matrix: Solid
Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.492**		0.228	0.233		0.145	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Actinium-227	0.0113	U	0.0230	0.0231		0.856	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Bismuth-212	-0.0298	U	0.959	0.959		0.787	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Bismuth-214	**0.623**		0.195	0.205		0.0777	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Cesium-137	0.0310	U	0.0629	0.0630	0.0700	0.0482	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Cobalt-60	-0.0330	U	0.102	0.102	0.200	0.0485	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Lead-210	-1.37	U	2.16	2.16		1.83	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Lead-212	**0.618**		0.122	0.138		0.0582	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Lead-214	**0.588**		0.146	0.158		0.0567	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Potassium-40	**11.5**		1.69	2.06		0.145	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Protactinium-231	0.000	U	0.403	0.403		3.51	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Radium-226	**0.623**		0.195	0.205	0.700	0.0777	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Radium-228	**0.492**		0.228	0.233		0.145	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Thallium-208	**0.254**		0.0869	0.0906		0.0273	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Thorium-228	**0.618**		0.122	0.138		0.0582	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Thorium-232	**0.492**		0.228	0.233		0.145	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Thorium-234	**1.97**		1.39	1.41		0.827	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Uranium-235	0.0368	U	0.204	0.204		0.520	pCi/g	07/15/18 22:28	08/05/18 20:41	1
Uranium-238	**1.97**		1.39	1.41		0.827	pCi/g	07/15/18 22:28	08/05/18 20:41	1

Client Sample Results

Client: Aptim Federal Services LLC
TestAmerica Job ID: 160-29414-2
Project/Site: Hunters Point Naval Shipyard - Parcel E2

Client Sample ID: PE2-RSYC8-U11-LLRO-S003
Lab Sample ID: 160-29414-3

Date Collected: 07/03/18 12:42
Matrix: Solid
Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.528**		0.178	0.186		0.0351	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Actinium-227	0.154	U	0.619	0.620		0.421	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Bismuth-212	-0.324	U	0.645	0.646		0.846	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Bismuth-214	**0.549**		0.146	0.157		0.0636	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Cesium-137	-0.0523	U	0.0911	0.0912	0.0700	0.0712	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Cobalt-60	-0.0251	U	0.0381	0.0382	0.200	0.0560	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Lead-210	0.209	U	0.867	0.868		0.659	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Lead-212	**0.307**		0.102	0.110		0.0647	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Lead-214	**0.580**		0.137	0.150		0.0512	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Potassium-40	**9.93**		1.58	1.88		0.266	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Protactinium-231	0.531	U	1.91	1.91		2.09	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Radium-226	**0.549**		0.146	0.157	0.700	0.0636	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Radium-228	**0.528**		0.178	0.186		0.0351	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Thallium-208	**0.121**		0.0860	0.0870		0.0370	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Thorium-228	**0.307**		0.102	0.110		0.0647	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Thorium-232	**0.528**		0.178	0.186		0.0351	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Thorium-234	-0.0400	U	1.24	1.24		1.02	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Uranium-235	0.0848	U	0.274	0.274		0.241	pCi/g	07/15/18 23:28	08/06/18 12:56	1
Uranium-238	-0.0400	U	1.24	1.24		1.02	pCi/g	07/15/18 23:28	08/06/18 12:56	1

Client Sample ID: PE2-RSYC8-U11-LLRO-S004
Lab Sample ID: 160-29414-4

Date Collected: 07/03/18 12:45
Matrix: Solid
Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	**0.759**		0.156	0.174		0.0377	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Actinium-227	0.0550	U	0.711	0.711		0.583	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Bismuth-212	-0.543	U	1.07	1.07		0.839	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Bismuth-214	**0.476**		0.131	0.140		0.0409	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Cesium-137	0.0304	U	0.0503	0.0504	0.0700	0.0370	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Cobalt-60	0.00866	U	0.00707	0.00713	0.200	0.0498	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Lead-210	-0.0983	U	1.39	1.39		1.14	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Lead-212	**0.386**		0.0992	0.111		0.0523	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Lead-214	**0.501**		0.108	0.120		0.0452	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Potassium-40	**10.3**		1.69	1.99		0.246	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Protactinium-231	-1.18	U	3.87	3.87		3.16	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Radium-226	**0.476**		0.131	0.140	0.700	0.0409	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Radium-228	**0.759**		0.156	0.174		0.0377	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Thallium-208	0.0343	U	0.0999	0.100		0.0555	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Thorium-228	**0.386**		0.0992	0.111		0.0523	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Thorium-232	**0.759**		0.156	0.174		0.0377	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Thorium-234	0.272	U	1.54	1.54		1.25	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Uranium-235	0.204	U	0.312	0.313		0.248	pCi/g	07/15/18 23:28	08/06/18 12:58	1
Uranium-238	0.272	U	1.54	1.54		1.25	pCi/g	07/15/18 23:28	08/06/18 12:58	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29414-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-375715/1-A
Matrix: Solid
Analysis Batch: 380626

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 375715

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.01254	U	0.176	0.176		0.0924	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Actinium-227	0.1784	U	0.296	0.297		0.323	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Bismuth-212	-0.3174	U	0.593	0.594		0.451	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Bismuth-214	-0.08923	U	0.110	0.110		0.151	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Cesium-137	0.01680	U	0.0361	0.0361	0.0700	0.0183	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Cobalt-60	-0.06211	U	0.0595	0.0598	0.200	0.0476	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Lead-210	-0.1413	U	1.01	1.01		0.821	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Lead-212	0.02924	U	0.0625	0.0626		0.0489	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Lead-214	0.06566		0.0719	0.0722		0.0508	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Potassium-40	-0.4150	U	0.492	0.494		0.508	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Protactinium-231	0.0000	U	0.276	0.276		1.77	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Radium-226	-0.08923	U	0.110	0.110	0.700	0.151	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Radium-228	0.01254	U	0.176	0.176		0.0924	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Thallium-208	0.01981	U	0.0159	0.0160		0.0299	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Thorium-228	0.02924	U	0.0625	0.0626		0.0489	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Thorium-232	0.01254	U	0.176	0.176		0.0924	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Thorium-234	0.1980	U	0.490	0.490		0.594	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Uranium-235	0.09345	U	0.292	0.292		0.235	pCi/g	07/15/18 22:28	08/06/18 01:32	1
Uranium-238	0.1980	U	0.490	0.490		0.594	pCi/g	07/15/18 22:28	08/06/18 01:32	1

Lab Sample ID: LCS 160-375715/2-A
Matrix: Solid
Analysis Batch: 380627

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 375715

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2 +/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	96.64		11.4		0.665	pCi/g	100	87 - 116
Cesium-137	28.2	31.33		3.29	0.0700	0.134	pCi/g	111	87 - 120
Cobalt-60	12.9	13.94		1.45	0.200	0.0319	pCi/g	108	87 - 115

Lab Sample ID: MB 160-375721/1-A
Matrix: Solid
Analysis Batch: 380606

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 375721

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.06106	U	0.550	0.550		0.449	pCi/g	07/15/18 23:28	08/05/18 21:42	1
Bismuth-212	0.0000	U	0.0995	0.0995		0.556	pCi/g	07/15/18 23:28	08/05/18 21:42	1
Bismuth-214	0.0000	U	0.0341	0.0341		0.101	pCi/g	07/15/18 23:28	08/05/18 21:42	1
Cesium-137	-0.01014	U	0.0604	0.0604	0.0700	0.0486	pCi/g	07/15/18 23:28	08/05/18 21:42	1
Cobalt-60	-0.001196	U	0.0707	0.0707	0.200	0.0151	pCi/g	07/15/18 23:28	08/05/18 21:42	1
Lead-210	-1.036	U	0.508	0.522		1.03	pCi/g	07/15/18 23:28	08/05/18 21:42	1
Lead-212	-0.01106	U	0.0644	0.0644		0.0536	pCi/g	07/15/18 23:28	08/05/18 21:42	1
Lead-214	0.01895	U	0.0758	0.0759		0.0598	pCi/g	07/15/18 23:28	08/05/18 21:42	1
Potassium-40	-0.2372	U	0.812	0.813		0.292	pCi/g	07/15/18 23:28	08/05/18 21:42	1
Protactinium-231	0.0000	U	0.122	0.122		1.67	pCi/g	07/15/18 23:28	08/05/18 21:42	1
Radium-226	0.0000	U	0.0341	0.0341	0.700	0.101	pCi/g	07/15/18 23:28	08/05/18 21:42	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29414-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: MB 160-375721/1-A
Matrix: Solid
Analysis Batch: 380606

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 375721

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	-0.01106	U	0.0644	0.0644		0.0536	pCi/g	07/15/18 23:28	08/05/18 21:42	1
Thorium-234	-0.5641	U	0.602	0.605		0.538	pCi/g	07/15/18 23:28	08/05/18 21:42	1
Uranium-235	-0.01308	U	0.0296	0.0297		0.186	pCi/g	07/15/18 23:28	08/05/18 21:42	1
Uranium-238	-0.5641	U	0.602	0.605		0.538	pCi/g	07/15/18 23:28	08/05/18 21:42	1

Lab Sample ID: MB 160-375721/1-A
Matrix: Solid
Analysis Batch: 380626

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 375721

Analyte	MB Result	MB Qualifier	Count Uncert. (2 +/-)	Total Uncert. (2 +/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.05434	U	0.129	0.129		0.0653	pCi/g	07/15/18 23:28	08/06/18 21:20	1
Radium-228	0.05434	U	0.129	0.129		0.0653	pCi/g	07/15/18 23:28	08/06/18 21:20	1
Thallium-208	0.01298	U	0.0523	0.0523		0.0204	pCi/g	07/15/18 23:28	08/06/18 21:20	1
Thorium-232	0.05434	U	0.129	0.129		0.0653	pCi/g	07/15/18 23:28	08/06/18 21:20	1

Lab Sample ID: LCS 160-375721/2-A
Matrix: Solid
Analysis Batch: 380607

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 375721

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2 +/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	100.8		10.6		0.562	pCi/g	104	87 - 116
Cesium-137	28.2	27.99		3.01	0.0700	0.127	pCi/g	99	87 - 120
Cobalt-60	12.9	13.08		1.38	0.200	0.0663	pCi/g	101	87 - 115

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29414-2

Rad

Leach Batch: 374782

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29414-1	PE2-RSYC8-U11-LLRO-S001	Total/NA	Solid	Dry and Grind	
160-29414-2	PE2-RSYC8-U11-LLRO-S002	Total/NA	Solid	Dry and Grind	
160-29414-3	PE2-RSYC8-U11-LLRO-S003	Total/NA	Solid	Dry and Grind	
160-29414-4	PE2-RSYC8-U11-LLRO-S004	Total/NA	Solid	Dry and Grind	

Prep Batch: 375715

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29414-1	PE2-RSYC8-U11-LLRO-S001	Total/NA	Solid	Fill_Geo-21	374782
160-29414-2	PE2-RSYC8-U11-LLRO-S002	Total/NA	Solid	Fill_Geo-21	374782
MB 160-375715/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-375715/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 375721

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29414-3	PE2-RSYC8-U11-LLRO-S003	Total/NA	Solid	Fill_Geo-21	374782
160-29414-4	PE2-RSYC8-U11-LLRO-S004	Total/NA	Solid	Fill_Geo-21	374782
MB 160-375721/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-375721/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	